

Appendix 1A-4: *2006 South Florida Environmental Report – Volume I Authors’ Responses to Comments*

A panel of outside experts provided peer review of the *2006 South Florida Environmental Report* through WebBoard comments, participation in a three-day public workshop, and a written final report (Appendix 1A-5).

Authors revised their chapters and related appendices responsively. This appendix includes authors’ responses to major comments in the panel’s final report and WebBoard.

With the exception of reformatting some information for better readability, this appendix was not edited by the SFER production staff.

Responses to General Peer-Review Comments on the 2006 SFER

On page 2 of the panel's final report, there are four general recommendations. Comments 1–3 are recommendations to SFER authors on how to better organize and present all of the report chapters. These are all worthy of careful consideration and will be discussed at the project kickoff meeting for the development of the *2007 South Florida Environmental Report*, scheduled in spring 2006. The fourth recommendation is more difficult to implement. It is not clear how the synthesis that is called for would go beyond the well-integrated material in the individual chapters. Linking the sorts of subjects that are mentioned (e.g., mercury, phosphorus, sulfur cycling) should be done as material is presented in the individual chapters. Again, in the organizational meeting for the 2007 report, we will explicitly discuss cross-chapter integration and determine how best to respond to these comments.

On pages 2–7, the Panel makes several suggestions for the 2007 SFER:

Cross-cutting Themes: The SFER production staff will review the suggested cross-cutting themes with both agency management and authors when the 2007 production process.

Tri-level Review System: The evolution of SFER peer review into a tri-level system seems appropriate and practical. When the statement of work is developed for the 2007 Peer-Review Panel, the Panel's suggestions for the various levels of review for sections and chapters of the report will become part of the assignment matrix for the review process. If the Panel for any reason doesn't agree with the assigned level of review, then the Panel, under the guidance of its Chairperson, can modify how this tri-level system is applied.

Chapter/Topic Integration Opportunities: With cross-cutting themes, the SFER production staff will review the suggested integration opportunities with both agency management and SFER authors when the 2007 production process begins. Many of these suggestions are also made in the individual chapters, and it will be at the authors' discretion to determine appropriate changes.

Cross-Chapter Recommendations: These thoughtful recommendations will be implemented by the authors, as appropriate, for the 2007 SFER. In particular, moving Chapter 5 up to the front of the report would appear to be worthwhile to provide a better flow of information. The SFER production staff will work with District managers and authors to make final decisions on the 2007 report organization. However, any revision to the report's organization does involve trade-offs, particularly because readers of the report are used to the current organization and it is important that major changes in the report's order not be made frequently for the sake of consistency.

A Final Word: To the extent that the project managers and SFER production team can improve communication and cooperation among SFER authors, they will do so both for the 2007 report as well as future SFERS. We also agree with the Panel that the SFER is a catalyst for communication and cooperation. However, we must also acknowledge that the SFER is basically a reporting vehicle documenting how agencies are managing their resources and how the resources are responding. The report itself cannot mandate cross-agency or cross-department cooperation, but can only encourage these positive aspects over the long term.

Chapters 1A and 1B: Responses to Peer Review and Public Comments

Garth Redfield and Stacey Efron

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

Comment: *The Panel recommends that consideration be given to preparing a Chapter 1C, noting only the most important research findings. In this manner the chapter would continue to summarize the overall process (1A), plus concentrate on a cross-cutting issue(s) of great importance as well as summarize major findings, providing a comprehensive summary for new readers as well as those searching for the highlights of the previous year.*

Response: These are all worthy of careful consideration. Due to the fact that this recommendation and several others may actually increase the amount of staff time that has to be invested in the 2007 report, the SFER production staff will organize a meeting of senior-level management and SFER authors prior to the project kickoff meeting (spring 2006) to decide on the appropriateness of a new section or chapter on research findings.

Comment: *It may be interesting to consider the potential impacts of 100-year storm events on existing structures in particular regions of the District such as the Kissimmee. This modeling exercise may provide an interesting topic for chapter 1B at some point in the future.*

Response: We agree that the impacts of a 100-year storm event would make an interesting topic either for Chapter 1B or as a special topic added to the hydrology chapter. The question of when to do such an analysis remains open.

Comment: *Another potential cross-cutting issue is the relationship between water residence time in the lake and WCAs, mandatory releases to the EAA and STAs in heavy rainfall years or specific events and any increases downstream from the EAA and the STAs of water quality indicators. As release of water from the lake affects all downstream areas, it can be considered a response transect (north to south) of the entire region in response to rainfall.*

Response: Again, as indicated above, the linkage between water in the lake and the WCAs is an area that would benefit from more attention. This will be added to the list of topics to be considered at the project kickoff meeting next spring, and it may be a good area for collaboration of several of the chapters in future SFERs.

Comment: *The importance of this restoration effort cannot be overestimated. It is taking on greater importance internationally and is being cited with greater frequency throughout the world. Therefore, the Panel continues to urge that when possible data should be presented using metric scales rather than, or at least along with, English scales of measurement. In addition, consistency in units is needed throughout the Report.*

Response: Comment appreciated. This recommendation will be incorporated into the style guidelines for the 2007 SFER. In addition, to attempt to improve compliance, we will discuss this topic at the project kickoff meeting to gain better understanding of the importance of using the metric system and to be consistent in the units being used across chapters.

Comment: *Brief clarification would be helpful about the status of progress in restoring the natural hydrology of the Rotenberger WMA by including discharge from STA-5, including description of the quality of the water being discharged (line 192). Associated problems contributed by high nutrient concentrations and other pollutants in the inflows should be mentioned (lines 429-430). Clarification would also be helpful on biological indicators emphasized in addition to seagrasses (lines 604, 898).*

Response: Clarification has been added to the final report.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: *p. 1A-4, Figure 1A-1: Arrow for Lake Worth Lagoon misplaced.*

Response: Comment appreciated. This map has been corrected.

Comment: *p. 1A-17: Mention of the Everglades lawsuit and the relevance of the Settlement Agreement would be useful under this heading.*

Response: Clarification will be added to the 2007 report, giving a context to the lawsuit and the Settlement Agreement.

Comment: *p. 1A-20, Paragraph beginning on line 795: Need to make it clear that the topic of the paragraph and the numbers refer to phosphorus.*

Response: Clarification has been added to the final report.

Comment: *p. 1A-21, Paragraph beginning on L-833: Not sure what period of time the first sentence refers to, but the lake levels clearly have not been favorable for SAV for at least the last 12 months.*

Response: Clarification has been added to the final report.

Chapter 2A: Responses to Peer Review and Public Comments

Kenneth Weaver and Grover Payne (FDEP)

RESPONSES TO PEER REVIEW PANEL COMMENTS

Comment: *Upon closely reading Chapter 2A regarding DBHYDRO, there are assurances that the data in DBHYDRO meet a variety of QA/QC requirements, but those requirements are not explained in Chapter 2A nor are they formally referenced in the chapter. Also, it is not clear where the data in DBHYDRO originates (from the 54 monitoring projects described on the website: www.sfwmd.gov/org/ema/envmon/wqm/). The data used in the standard compliance evaluations appear to be a subset of the total DBHYDRO data base - is this true? How are the sites selected for conducting the standards evaluation? In the past, explanations for the grouping of stations into the various categories (e.g., inflow, interior, and outflow) were provided, but this information is not cited in this report.*

Stations are noted on maps in Chapter 2 for the standards compliance evaluation purposes – are there stations in DBHYDRO that are not used? Is the water quality network used for standard compliance purposes defined and documented? Can the network design be referenced? Would it be possible to list formal references, linked to the report, for all the sampling and laboratory methods employed in placing water quality data in DBHYDRO? Is it possible to summarize, via a list, the different sources of water quality data in the database and that subset employed in Chapter 2A? If this information is already available, can it be referenced and linked to Chapter 2A?

Response: Additional references and information have been added to the final chapter to clarify the QA/QC requirements.

The sites used in the Chapter 2A standards compliance evaluations are in fact a subset of the DBHYDRO data base. All routine ambient and structural (inflow and outflow) data collected within the Everglades Protection Area (EPA) were used in both Chapters 2A and 2C. The 54 monitoring projects within DBHYDRO include projects conducted outside the EPA and therefore are excluded from the Chapter 2A analyses. The water quality monitoring network is documented in Figures 2A-1 through 2A-5 and on the SFWMD Web site. Additional clarification regarding the monitoring network, including a list of projects, was added to the final chapter.

Comment: *Is it possible to discuss implications of the unusual WY 2005 hydrology to the standard compliance assessment? Chapter 1B indicates there were not many implications - why? The standard compliance trends presented do not appear to reflect much, if any, impact from WY2005 extremes?*

Response: Water quality criteria excursion rates were within typical ranges, despite the unusual hydrologic conditions during WY2005; that is, little or no impact from the WY2005 hydrologic extremes were appear. Additional discussion was added to the final chapter to address this comment.

Comment: *The data used in evaluating standard compliance in Chapter 2 needs to be better defined and documented (e.g., why are the data used in the evaluation selected from all that is available and can access to QA/QC methods be made easier?).*

Response: Additional clarification and information were added to the final chapter to address this comment.

Chapter 2B: Responses to Peer Review and Public Comments

Donald M. Axelrad, Thomas D. Atkeson, Curtis D. Pollman
and Ted Lange (FDEP)

RESPONSES TO PEER REVIEW PANEL COMMENTS

Comment: *This year's research progress report is a little brief, without providing enough details on the research itself. The methods of dosing birds require more explanation, since individual birds eat different amounts of food, and thus can acquire different doses of mercury. Should breast feathers be regularly taken to provide some indication of overall dose over the years for individual birds? Similarly, the way the atmospheric mercury studies will be supported is not clear, but this is an important and critical aspect of the overall plan. Any planned research to understand the relationship between mercury levels and sulfur are critical for understanding the Everglades at this point.*

Response: Details on wading bird toxicology research have been added (feathers will be taken and blood collected, and shed feathers analyzed to ascertain mercury (Hg) exposure in birds). A Wetlands Ecological Research Aviary is now operating, with the goal of more accurate determination of the risk threshold of mercury to fish-eating wading birds; interim results should be available for the 2007 SFER (see "Mercury Program Future Activities" section of the chapter for details on atmospheric mercury studies). Sulfur and mercury studies will continue for at least for another 7 months. Resources will be sought to investigate mercury and sulfate relationships in the Everglades National Park.

Comment: *The role of atmospheric deposition on Everglades lands in a dry-cycle should be addressed, and the relative effect of changes in the frequency of this wetting/drying cycle should be explored.*

Response: Additional sediment dry and rewet studies are planned. This year mercury biogeochemists will look at how different Everglades soil types respond to dry-rewet cycles – focusing on Hg methylation. Previous research has investigated the relationship between the length of soil drying and MeHg production. This information could be used for modeling how changes in frequency and location of drying would impact MeHg production.

The larger issue implicit in this comment is: How do we develop a better understanding of the bidirectional fluxes of mercury as it interacts with surfaces of differing characteristics?

In FY2005/2006 and FY2006/2007 USEPA ORD and FDEP will implement a small but intensive evaluation of dry deposition measurement technologies. We then propose to subsume this work into a joint, three-year field study of the physicochemical processes of dry processes in Peninsular Florida. We are presently evaluating field sites to complement the existing mercury Super Site at Coral Springs with sites in Everglades National Park and Tampa. The research site at the Refuge also offers opportunity for short-term intensive studies of mercury flux and reflux.

Comment: A fuller discussion of the EPA 0.3 mg/kg criterion for fish should be included, along with ways to reach this goal for the Everglades. In general, no part of the Everglades system appears to be below this level. This is particularly relevant to the Everglades National Park (ENP), which continues to show high mercury levels in fish. While it makes sense that fish-eating birds and mammals are still at risk, some overall discussion of the biota particularly at risk, along with levels in these organisms should be added here. The continued high levels in ENP require additional, targeted studies, and should be explored, particularly the role of sulfate. At the least, a more complete bio-monitoring plan should be instituted for the ENP to isolate and bound the problem within the ENP.

Response: A fuller discussion of the proposed USEPA 0.3 mg/kg fish tissue criterion for human consumption of fish has been added to the chapter.

There are few data on mercury levels in Everglades mammals - levels in panthers foraging around the Everglades were high but panthers foraging in terrestrial sites exhibit lower body burdens. There are data on raccoons; we know of none on otters and mink. Mercury levels in fish have served to indicate risk to fish-eating fauna and their predators (there are mercury data for great egrets and white ibis, and note the 2004 ECR, Appendix 2B-4 - [A Retrospective Study of Mercury Contamination in Avian Tissues from South Florida](#)). As well, note the District (Darren Rumbold) recently conducted a probabilistic risk assessment which indicated that the probability of great egrets (or mallards) being exposed to mercury at levels higher than the LOAEL at a site in the ENP ranged as high as 75 percent. Also, note that Gary Heinz, USGS, has recently shown that Everglades wading birds may be more sensitive to mercury than mallards, as reported in the 2004 ECR (http://www.sfwmd.gov/org/ema/everglades/consolidated_04/final/chapters/ch2b.pdf)

Resources will be sought to investigate the high levels of mercury in fish in the ENP; the 2005 USEPA Everglades REMAP Study has just commenced and will provide useful data.

There is a need to investigate the role of sulfur regarding Hg methylation particularly in the ENP; on phosphorus release from sediments; and, regarding sulfide toxicity in sediments in the broader Everglades. Resources will be sought to investigate these issues.

Comment: The identification this year of the importance of sulfur pollution in the Everglades is an important addition to the chapter. This section could be expanded since it is a relatively newly described problem for mercury cycling.

Response: A more extensive treatment of mercury relationships in the Everglades is given herein.

Comment: The relationships between mercury and sulfur, in both surface waters and pore waters should be explored, both in the text and in figures that are easily interpreted. Partly having a table with mercury concentrations (as well as organic carbon concentrations) by area would help integrate sulfide and sulfate data already presented. ... temporal trends in sulfate levels in the Everglades...

Response: See Chapter 2B of the 2005 SFER – Volume I regarding station 3A-15 (http://www.sfwmd.gov/sfer/SFER_2005/2005/volume1/v1contents.html). More sulfur data analysis will be conducted for next year's SFER.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: page 2B-2: Comment on the bullet pertaining to the effect of DOC. We believe that DOC is actually promoting the bioavailability of mercury through sorption to components of the DOC that the methylating microbes target for uptake and accidentally take in mercury as a result.

Response: A great number of compounds are represented in “DOC” (dissolved organic carbon). Some DOC fractions may promote dissolution of solid phase mercury (Hg), making it available for methylation by sulfate-reducing bacteria (SRB); other DOC fractions by complexing with Hg may make it unavailable for uptake by SRB.

Comment: page 2B-21: I believe some of the details of Dr. Orem’s hypothesis on how excess sulfide produced from the EAA sulfate load is likely causing a toxic response to the Everglades infauna. The ‘internal eutrophication’ is an important aspect of just one of the possible negative influences of sulfate on this ecosystem, but quite possibly, the direct toxic effects can be even more lethal. Other studies on freshwater wetlands have shown how excess sulfide can cause deleterious effects due to reduced redox conditions, suffocation, and limiting availability of necessary micro nutrients. Combined, these factors could very well be playing a central role in the undesirable conversion of large areas of the Everglades from dominantly sawgrass stands to cattail, which are insulated from the toxic effects of sulfide.

Response: Text on ongoing sulfide toxicity research has been added along with recommendations for further Everglades sulfur research.

REVIEWER COMMENTS

Comment: Line 32 - Methylation is generally highest at 2 - 10 mg/L sulfate in surface waters, and 5 to 150 ppb porewater sulfide. Using these criteria, and Figures 2B-11 and 2B-12, methylmercury (MeHg) should be greatest in northern WCA-3A and an isolated area in Everglades National Park southwest of Homestead. However, recent high concentrations of mercury in sunfish and largemouth bass are not coincident with these locations.

Response: Figures 2B-11 and 2B-12 refer to years 1994/1995 through 2000, when sulfate levels in WCA-3A were higher – refer to Figures 2B-11 and 2B-12 in the 2005 SFER (http://www.sfwmd.gov/sfer/SFER_2005/2005/volume1/v1contents.html).

Comment: Line 37 - The Everglades Agricultural Area (EAA) is an important source of sulfur to the Everglades. Does this statement refer to sulfur in fertilizer, soil mineralization, rainfall, flow through water from Lake Okeechobee or all sources of sulfur associated with the EAA? If sulfur inputs from the EAA were terminated, would MeHg still be a concern in the Everglades?

Line 416 – Concentrations of sulfate in Everglades surface waters indicate that canal water draining the Everglades Agricultural Area (EAA) is the principle source of sulfate to Everglades marshes ... Stable isotope date ... are also consistent with agricultural sulfur and sulfate from other fertilizers and soil amendments. Are these statements consistent or inconsistent with findings by Schueneman (2000) - Characterization of Sulfur Sources in the EAA. Soil and Crop Sciences Society Florida Proceedings?

Line 463 – As such, it is probable that the toxic effects of elevated sulfide in Everglades porewaters, resulting from sulfate contamination from the EAA, is causing an “imbalance of

flora and fauna.” Do you have any evidence that Everglades’ flora and fauna has suffered from the toxic effects of porewater sulfide?

Line 475 – Preliminary Everglades data too show that sulfate additions to surface waters result in increased liberation of phosphorus from sediments and increased sediment porewater and surface water phosphorus concentrations (Bill Orem, USGS Pers. Comm.). The scientific community has understood for some time that phosphorus fluxes from sediments with a high phosphorus concentration relative to the overlying water. The idea that sulfur is a mechanism in phosphorus diffusion is intriguing. I urge you, or Bill Orem, to present his data so that the scientific community can examine its potential consequences on restoration efforts.

Line 628 – The most promising remaining means of managing MeHg in the Everglades may be by controlling sulfate loading. Do you have any specific ideas how to control sulfate loading?

Response: The sulfur section of the chapter has been revised to address these questions.

Comment: *A third figure similar to Figures 2B-11 and 12 indicating concentrations would ease comparisons. Line 39 - Dissolved organic carbon inhibits methylation and limits bioavailability of MeHg. Could you provide a figure similar to 2B-11 and 12 indicating dissolved organic carbon concentrations?*

Response: See the 2005 SFER for such comparisons for site 3A-15 (http://www.sfwmd.gov/sfer/SFER_2005/2005/volume1/v1contents.html).

Comment: *L26-29. Do you know why newly deposited Hg is more bioavailable than the native (old) Hg? By what criteria you define new and old? Or when a ‘new’ Hg turns to ‘old’?*

Response: The observed decrease in Hg bioavailability through time after deposition is related to changes in partitioning between the dissolved and solid phase, and perhaps to changing dissolved speciation. Mercury is probably deposited to ecosystems as a simple salt that is relatively soluble and perhaps bioavailable (although the complexation of Hg in wet and dry deposition is poorly understood). Mercury rapidly binds to strong dissolved and particulate ligands. Presumably, through time, Hg becomes incorporated into the interior of particles or into insoluble mineral phases that are less available to cells.

Comment: *L68-69. What are the sources of Hg originating from South Florida?*

Response: Presently, anthropogenic point source emissions of mercury from South Florida are calculated to be a small fraction (about 7 percent) of ca. 1990 levels. However, the South Florida area source influence, composed of a myriad of smaller mercury emissions sources, remains poorly quantified. Some evidence suggests that local source influences are no longer declining (e.g., the total number of medical waste incinerators in Florida has rebounded from a low of two to eighteen statewide, with eight in South Florida). Despite the substantial earlier reductions, a ‘micro’-emissions inventory of South Florida may be required to identify opportunities to further evaluate area emissions.

Comment: *L417 Stable isotopes of S may be a useful tracer to the source and pathways of Hg cycles. What are the delta S34 values of the surface water, atmospheric deposition and sediments?*

Response: See Appendix 2B-3 of the 2005 SFER – Volume I, [Impacts of Sulfur Contamination on the Everglades System](#).

Comment: *L472, Do drying and wetting cycles in the EPA also cause “internal eutrophication” of phosphorus (P)? Oxygen is a much more powerful electron acceptor than sulfate.*

Response: Drying and oxygenation of sediments is likely to bind P with iron – if available. Rewetting, which often results in anoxic conditions and sulfate reduction, may release P from both iron complexes and organic material.

Chapter 2C: Responses to Peer Review and Public Comments

Grover Payne and Kenneth Weaver (FDEP)

RESPONSES TO PEER REVIEW PANEL COMMENTS

Comment: *Given the comparison of P levels with historical trends, will the stations in the new P monitoring program include some existing stations, to take advantage of historical trends, or will they all be new stations?*

Response: Wherever possible the phosphorous criterion monitoring network will be comprised of existing monitoring sites to take advantage of and build upon the existing historical information. However, due to the limited spatial coverage of existing sites in some areas, a small number of new monitoring sites will likely also be incorporated into the monitoring network currently being developed.

Comment: *The data used in Chapter 2A and 2C comes from two separate databases: DBHYDRO and the SFWMD's Everglades Research Database. What is the distinction between the two databases? Is DBHYDRO storing only operational data while the research database stores all research data, or does the research database store only data from the nutrient gradient sampling stations?*

Response: The two databases were developed to store the data collected by different sections of the SFWMD. DBHYDRO is used to store a wide variety of data including operational data, the results of permit related monitoring, and data from routing ambient monitoring. SFWMD's Everglades Research Database only stores the data generated by the District's research group and includes data from: monitoring conducted along chemical and biological gradients in the Everglades; and mesocosm, greenhouse, and laboratory studies. The data from the research database was used to supplement the data from DBHYDRO.

Comment: *The TP loads to the EPA during WY2005 are noted as being significantly lower than the 1979-1988 baseline period (lines 632-634), yet the loads to the Refuge during WY 2005 are 252% greater than the previous year (lines 653-655). Did reductions in loadings between 1988 and 2004 cause the differences in the above two statements?*

Response: Yes, there has been a dramatic decrease in loading to the EPA since the historical period due to the implementation of the STAs and BMPs with some of the lowest values being observed during WY2004. The loading during WY2005 was significantly above the WY2004 level due to effects of the extreme weather events that occurred during the year.

Chapter 3: Responses to Peer Review and Public Comments

Carlos Adorasio, Carmela Bedregal, Pamela Sievers and
Stuart Van Horn

RESPONSES TO PEER REVIEW PANEL COMMENTS

Comment: *Regarding monitoring, a concern was raised about compliance monitoring in the EAA with the removal of almost 50 percent of the sampling sites because of hydraulic alterations to the drainage system. Retaining consistency from year to year so that estimated total phosphorus (TP) loadings reflect actual changes in the system rather than changes in the monitoring is the issue.*

Response: The EAA basin TP load compliance methodology has two main tenets to help assure compliance determinations can be made in an unbiased way and in the most accurate manner possible. The first tenet involves monitoring consistency and network coverage so that (1) all monitored locations used for determining basin level compliance with the mandated TP load reduction requirement have an identical monitoring program in place for the collection of TP samples and real-time data for flow estimations, and (2) all inflow and outflow locations comprising the “control volume” boundary must be monitored and accurately represented in the compliance model. Hydraulic alterations in the drainage system have occurred with the introduction of new inflows or outflows from the EAA boundary, mostly as a result of STA construction in the EAA. Monitoring reductions (increases in some cases) are a result of these boundary condition changes.

The second tenet is that consistency needs to be maintained between the historic baseline period and future periods when using the compliance model to calculate the predicted load from the contributing area of the EAA basin. During the baseline period, the contributing area to runoff from the EAA was much larger than it is today. As Stormwater Treatment Areas (STAs) have been constructed on lands once occupied by farms, there has been an accompanying reduction in the contributing area to runoff. Since the baseline runoff was based on the contributing area at the time and knowing that area reductions in the future would occur, the prediction equation to estimate future EAA basin TP runoff loads was developed with an area adjustment factor. The adjustment factor used in the compliance model allows for an apples-to-apples comparison of predicted load and the observed load based on the current contributing area.

Additional responses to this comment are included with a response to a similar comment found in this section.

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

Comment: While the BMP “equivalents” provide an innovative basis for BMP implementation, the Panel recommends that the “equivalents” assigned to each BMP be reviewed periodically in light of additional experience gained and effectiveness found for each BMP.

Response: The equivalents system was created to provide for a balanced compliance strategy in light of the many uncertainties surrounding BMP effectiveness at the time of program inception and to provide for an equitable level of effort among permittees for determining permit compliance. Since the program inception, much has been learned and BMPs have proven to be effective in reducing TP loads in discharges; however, quantifying the effectiveness of individual BMPs remains a challenge because of the inability to isolate the effects of an individual BMP from the many other variables affecting water quality in the field. The equivalents system has been very successful with respect to providing a balanced approach and adequate safeguards to account for the uncertainties that still exist.

All EAA permittees are required to implement a comprehensive plan that includes selection of BMPs from the primary categories known to contribute to phosphorus in runoff: water management, nutrient management and particulate controls. This method allows a farm that does not have the same flexibility with water management because of site conditions (e.g., shallower soils and less water tolerant crops) to create an “equivalent” BMP plan by providing a higher level of effort in another category such as particulate controls. The equivalents weigh in the level of effort for each type of BMP as well as effectiveness even though that effectiveness is not quantifiable.

The table below compares BMP plans for two different circumstances and how the equivalents system of points provides for a balanced compliance effort. The table shows how one farm with different site conditions is implementing what was originally assumed to be a higher level of effort for the water management BMP by retaining 1 inch of rainfall runoff in soil storage as compared to a farm with shallow soils that is only able to provide 0.5 inch of rainfall runoff in soil storage but still has a comparable BMP plan because of additional particulate controls being implemented. As a result, a permittee receiving credit for fewer equivalents under one type of BMP (e.g., water management) must strengthen or balance their BMP plan in other areas (nutrient management or particulate control BMPs).

Example Sugarcane Farm - Deep Soils		Example Sugarcane Farm - Shallow Soils	
BMP	Points	BMP	Points
1" Rainfall Detention	10	1/2 " Rainfall Detention	5
Controlled Fertilizer Application	2.5	Controlled Fertilizer Application	2.5
Fertilizer Spill Prevention	2.5	Fertilizer Spill Prevention	2.5
Soil Testing	5	Soil Testing	5
Four Particulate Controls	5	Six Particulate Controls	10
Total	25	Total	25

There are many challenges associated with pinpointing the effectiveness of BMPs in real practice. Similar BMP plans can be associated with very different concentrations and loads because of site-specific conditions or incidental factors. Experience suggests that how a BMP is implemented can be as important as which BMP is selected.

BMP effectiveness and optimization is continuously under review as site inspections are performed. Site inspections are the most productive method for optimizing how a BMP is implemented because it is the only method for determining the many site specific conditions affecting the implementation and therefore the relative effectiveness of the BMP. Additionally, there will be continued review of BMP effectiveness, in terms of regional application, through research as mandated by the Everglades Forever Act and carried out through the Everglades Agricultural Area Master Permit for BMP Research, Testing, and Implementation.

In partnership with UF/IFAS, the District is increasing the level of one-on-one contact with the growers to evaluate how the BMPs are implemented under site specific conditions and how refining existing methods of implementing BMPs will improve their relative effectiveness. Considering the success of the current system of equivalents in meeting the intended purpose, compelling evidence would be necessary to significantly revise the equivalents system, including the basis for the approach.

Comment: *The Panel recommends that more information be provided so that the calculations that result in the data presented in Table 3-6 can be replicated. For example, the Three-Year Average Phosphorus Load % Reduction is apparently not based on the WY Annual Calculated Phosphorus Load Reduction, and it is not clear how it is calculated. How is the three year averaging done—is it a simple or weighted three year average? Does the average represent the current and previous two years, the current, previous and next year, etc.? Is the average flow weighted? More elaboration (including equations as appropriate) in the text for these calculations is needed, and this can be presented in the appendix.*

Response: The Three-Year Average Phosphorus Load % Reduction in Table 3-6 represents a weighted three-year average of the observed and predicted annual loads. The weighted equation is:

$$\% \text{ Reduction} = [1 - \sum (\text{Observed Load}) / \sum (\text{Predicted Load})] \times 100$$

where the summation covers three successive water years consisting of the current water year and prior two water years.

The current three-year average ending with WY2005 is calculated as:

$$[1 - (81 + 82 + 182.3) / (125 + 229 + 444)] \times 100 = 57\%$$

A footnote for this calculation as well as the appropriate footnote for the Three-Year Flow-Weighted Mean Phosphorus Concentration will be added to Table 3-6.

Comment: *The Panel recommends that explanation be added that will clarify how the predicted TP loads given in Tables 3-7 and 3-12 are calculated. Again equations would help.*

Response: The predicted TP loads for the EAA and C-139 basins are calculated using a regressed relationship between historic annual rainfall and runoff TP load observed during a baseline period covering WY1980–WY1988 (nine years). The EAA regression relationship was constructed to

account for rainfall variation in both a spatial (Thiessen) and temporal (monthly distribution statistics) domain. Based on the temporal domain, statistical coefficients for the first three moments were developed from the historic rainfall to develop predictors of load.

The process of calculating a predicted EAA TP load in any given water year, (post-baseline) consists of (1) tabulating current rainfall amounts for each compliance monitoring network rain gauge (nine gauges) on a monthly basis, (2) applying Thiessen weights to derive a basin-wide weighted monthly rainfall amount, and (3) plugging the weighted monthly rainfall amount into the regression relationship, along with base-line predictors, to derive a predicted TP load. If rainfall amounts are approximately the same from one year to the next (i.e., 52 inches), then the predicted TP load could vary significantly between years depending on the temporal distribution of the monthly rainfall.

The predicted TP loads for the C-139 basin are based on an exponential regression of paired sets of annual rainfall and TP load data observed during the baseline period. Temporal variation in the regression is not considered within a year (i.e., monthly) when predicting TP loads, but was a factor in choosing the base-line (temporal) period to assure a range of hydrologic regimes (wet, average, and dry) were considered for model calibration.

The process of calculating a predicted C-139 TP load in any given water year (post-baseline) consists of (1) tabulating current rainfall amounts for each compliance monitoring network rain gauge (three gauges) on an annual basis, (2) applying Thiessen weights to derive a basin-wide weighted annual rainfall amount, and (3) plugging the weighted annual rainfall amount into the regression relationship to derive a predicted TP load. Therefore, predicted annual TP load varies directly with annual rainfall amount in any given year, and widely varying TP load predictions do not occur since monthly temporal distribution factors are not included.

The explanations above will be incorporated into the chapter and the appendices. The appendices will include figures for clarity. The equations will not be reproduced in the chapter, but rather a hyperlink to Chapter 40E-63, Florida Administrative Code (F.A.C.), which contains all governing equations, will be added as a reference to the appendices and to the main chapter under the respective sections for EAA and C-139 Basin Compliance Determination.

Comment: *The Panel recommends information from the audits performed by FDEP on the various laboratories performing laboratory analyses be provided so that some QA/QC statistics can be calculated. For example, what is the distribution of laboratory performance on known constituent standards such as TP? What percent of laboratories do not meet QA/QC requirements of FDEP? For laboratories that are out of compliance, what action is taken by FDEP to bring them into compliance?*

Response: The Florida Department of Environmental Protection (FDEP) conducts either (1) performance audits in which a known sample is given to a lab technician for immediate analysis, or (2) project audits to determine if data is usable for established project criteria. FDEP also conducts the Everglades Round Robin (ERR) program in which participating laboratories analyze the same series of samples for total phosphorus and the results are evaluated against the sample data central tendency. The FDEP initiated the study in 1995 to assess the compatibility of phosphorus data from laboratories engaged in the analysis of samples from Everglades research.

Forty-one laboratories have participated in one or more of the 15 ERR exercises or series conducted to date. The standard audits performed by FDEP do not provide enough information on the various laboratories performing laboratory analyses to provide QA/QC statistics. The FDEP

ERR does provide information for QA\QC statistics (TP only). The Florida Department of Health (FDOH) performs (1) a certification sample program in which laboratories must analyze samples of known standards and the sample analysis results must be within 3 standard deviations of the know standard, and (2) system audits of sample analysis knowledge and methods. The FDOH certification sample program also provides information for QA/QC statistics.

In the ERR program, an actual sample with an unknown value is distributed to the participating laboratories. The participating laboratories TP analysis results are evaluated against the data central tendency to indicate how close or how far the results are from the sample mean. A zero (worst) through 5 (best) ranking system is used for ranking laboratory results. If the distance from the mean is large, then the linear model is highly influenced by the results from the laboratory and it is assigned a low value (0, 1, or 2).

Using this system, laboratory performance on TP analysis can be evaluated and the percentage of laboratories assigned to the different categories determined. The web site to obtain this information is <http://www.dep.state.fl.us/labs/everglades/index.htm>. Refer to the Statistical Analysis and Summary of ERR Exercises for Phosphorus section, which has the results for ERR exercises 2 through 15. The FDEP ERR is a voluntary program, and the FDEP does not have the responsibility to bring into compliance laboratories that score low.

For the FDOH laboratory certification program, laboratories must analyze samples of known standards and the sample analysis results must be within 3 standard deviations of the known standard value to be acceptable. A laboratory can apply for certification in a number of different analytes. A laboratory either “passes” the certification test or does not, but the FDOH does not report to the laboratory the actual sample results.

The FDOH has the sole responsibility to bring into compliance laboratories that fail to pass the certification sample program for different analytes but does not provide information on the percent of laboratories that fail. If the laboratory fails the FDOH certification sample program, the laboratory must file a corrective action program to correct the deficiency that caused it to fail.

The corrective action program may be to provide training to the lab technician who ran the sample or repair or replace the equipment used to analyze the sample. The laboratory must pass 2 out of 3 certification samples for the same analyte each year, so if it fails one sample it can try again in six months. If the laboratory fails again it must reapply for certification in the analyte. The web site where more information on the certification program can be obtained is <http://www.dep.state.fl.us/labs>. Refer to the Certified Laboratories (DOH-NELAC) section.

While some information that the reviewer requested is not available, other information is available at the specified web sites. Chapter 3 of this volume will be updated to include links to the FDEP and FDOH web sites to direct readers to locations where the available information can be obtained.

Comment: *Achievement of very low TP levels is very difficult, especially for storm water flows which are high and which generate high particulate and hence high TP concentrations. At some point, the desired levels of TP will be achieved or the District and FDEP will have to decide whether such low TP concentrations are achievable and at what cost. The Panel recommends that some thought be given to the basis for making such decision.*

Response: The Basin-Specific Feasibility Studies included an analysis to determine the effect on STA outflows at varying BMP reduction levels. The BMP reduction levels employed for major

inflow sources varied, but were typically assigned at 50 percent for the EAA basins. Varying the BMP reduction levels in the STA outflows from 25–75 percent in the baseline analyses resulted in an increase/decrease of 7–12 ppb. Following completion of possible STA optimization projects, varying the BMP reduction levels from 25–75 percent resulted in an estimated increase/decrease of only 0-5 ppb in STA outflows. At this time the required BMP reduction levels will remain as stipulated in the statutes; however, it may be reevaluated in the future.

Comment: *The Panel recommends that information be provided that speaks to monitoring consistency from year to year so that estimated TP loadings reflect actual changes in the system rather than changes in the monitoring is the issue.*

Response: Monitoring consistency is an extremely important aspect to consider in the EAA basin level monitoring program from both a water quality and quantity perspective. Much effort goes into developing monitoring programs and protocols to ensure consistency and minimize potential biases.

The way in which monitoring is conducted and the way sites are located are specified by rule in Appendices A and B, Chapter 40E-63, F.A.C. The EAA monitoring program and network design is setup to minimize the introduction of monitoring biases so that changes in the system can be measured utilizing the most accurate data. Therefore, all inflow and outflow monitoring sites are required to have flow-proportional autosamplers for the collection of TP samples. The samplers are setup for seven day collection cycles and samples are collected proportional to flow. Grab samples are also collected on the seventh day to serve as a backup to compute a load estimate at a specific site in the event of equipment failure or in case the composite sample is flagged during lab analysis.

The goal of the water quantity program (flow estimations) is to achieve an excellent accuracy level in which there is 95 percent confidence level that the flow estimate is accurate at all structures. The accuracy of flow rating equations is constantly improved through collection of field flow measurements for calibrating the flow equations. It generally takes several years of field data collection to improve or calibrate a flow rating equation. At the startup of a new structure, as was the case with STA-3/4 structures, the flow estimates will have lower accuracy levels, but do improve with time as more data is collected.

Additionally, all sites are monitored through telemetry to collect continuous real-time data on water levels and operations information (gate height openings, pump rpms, etc.) so that instantaneous discharge can be computed.

Several references are available on the original network design of the EAA basin-level monitoring program as well as standard operating procedures for the program that have been updated over time. These references will be cited in the chapter to improve the understanding of the monitoring program and how attempts to assure consistency are accomplished so that changes in the system are more accurately determined.

Furthermore, additional tabular information will be added to the appendices to explain in more detail about the water quality and quantity data used in estimating the TP loads during WY2005 (sample statistics, flagged data, equipment problems, accuracy level of flow rating equations, etc.). This will help improve the understanding of the quality and accuracy level of the data used in computing the TP loads at all sites. By ensuring that monitoring consistency is continuously strived for and that the best available data is used, it is hoped that the relative impact of

monitoring related issues are minimized so that the goal of accurately tracking system changes is achieved.

Comment: *The Panel recommends that more attention be paid to a whole body of work in “sustainable agriculture.” The USDA’s Sustainable Agriculture Research and Education program (SARE), and particularly its Southern Region program, is a valuable source in accessing this literature. This work could better inform the BMP program.*

Response: Technical resources in sustainable agriculture with emphasis on nutrient management, soil conservation, and water quality provide, indeed, supplemental tools that District staff can use to stay updated on strategies for maintaining sustainable farming operations and for outreach efforts. The Panel provides a valuable recommendation.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: *General: Despite large calculated reductions in loading from the EAA Basin, inflow concentrations to STA-1W have not clearly reduced (see Figure 1 above in comments on Chapter 2C).*

Response: Inflow concentrations to STA-1W are a result of various sources besides EAA basin surface water runoff, thus, one cannot assume a cause-effect relationship without a detailed analysis. Specific responses on the figure described above should be provided under Chapter 2 comments.

Comment: *p 3-9, Figure 3-1: missing label for Acme Basin A.*

Response: The Basin B label has been modified. It reads “ACME Improvement District” and points to both basins (A and B). This also makes the label consistent with the label in Figure 3-13.

Comment: *p 3-30, ll. 616-625: Is the reader to understand that this part of the rule will be revisited, but other aspects of the rule are not to be revisited?*

Response: The draft version of the SFER indicates that evaluations are currently underway to determine whether additional rule-making may be necessary to address BMP program implementation in 298 diversion areas. Nevertheless, other aspects of the rule may be revisited in the future, if rule-making is considered necessary based on Florida Statutes and with stakeholders’ input.

Comment: *p 3-33, ll. 714-718: The maps in the Appendices show differences at the farm-level in TP concentrations and loads. In fact, by looking at the same maps from the 2005 SFER, it is clear that there have been notable increases in loads and concentrations at the farm level in the region north of the refuge. Is the research concept identified in lines 714-718 designed to address and report on these changes? At what point does studying the changes in farm-level TP concentrations and loads translate into revisions to BMPs?*

Response: It is assumed that the commenter refers to the S-5A basin as the “region located north of the refuge” in the question above. The differences in the observed values between WY2004 (2005 SFER) and WY2005 (2006 SFER) are attributed to the increased rainfall levels observed in the S-5A basin due to hurricane activity. The S-5A basin received 57 inches of rainfall during WY2005 in comparison to an average of 49 inches for the other EAA basins. This can also be

observed when comparing the rainfall adjusted unit loads to account for the hydrological differences between WY2004 and WY2005.

The final version of the SFER will be revised to include both observed and adjusted unit loads (i.e., Rainfall Adjusted Unit Loads or RAULs) to facilitate readers' review and interpretation. The UF/IFAS basin-wide evaluation referenced by the commenter is an attempt to evaluate available data to assess parameters affecting phosphorus discharge. Your comment will be forwarded to the UF/IFAS, for them to evaluate whether it can be incorporated in their analysis. Please note that one-on-one consultations are underway with UF/IFAS staff to analyze implementation of BMP plans in priority areas, including farms within the S-5A basin. This should translate into further optimization of the program efficacy in the short and mid-term.

Comment: p. 3-52, l. 1208: *There are 3¾ pages of text on Acme Basin B and their efforts to reduce phosphorus. What is missing from this section is a description of the actual BMP goals initially established and where we currently are in trying to meet them. Additionally, it would be valuable to describe here why Acme Basin B discharges envisioned in the EAA Regional Feasibility Study are well above those envisioned by the BMP program.*

Response: The initial goal of the BMP source controls program was to reduce TP concentration by 25 percent within Acme Basin B. The District is continuing to work with stakeholders within the basin to implement BMPs, and it is anticipated that long term average concentrations will reach that goal.

The average annual discharge calculated by the Basin Specific Feasibility Study for the Long-Term Plan was 31,499 ac-ft, and Table 5.7 in Appendix G of the EAA Regional Feasibility Study shows the calculated value of 33,196 ac-ft. The variation between these volumes is due to one model being based on 31 years of data and the other being based on 36 years of data.

RESPONSES TO FDEP – TECHNICAL REVIEW COMMENTS

Comment: C-111 Figure 3-24, p.3-78: *Why are flow volumes reported for S-332 in 2003 and 2005? We were under the impression that this structure was no longer being used.*

Response: The S-332 and S-175 structures were used until WY2001 to make water deliveries to Taylor Slough in the Everglades National Park. However, after completion of some components of the C-111 project, these two structures are only used to provide flood relief during emergency conditions. Furthermore, these structures need to be maintained regularly. Therefore, they are also operated for short time periods during maintenance.

Comment: Appendix 3-2b, p. App.3-2b-4: *The descriptive legend with an explanation of lab numbers is not posted.*

Response: The heading on the 4th column of the table was incorrectly labeled as “lab number.” The heading has been changed to “test number.” The test number is an internal number used by the District to identify various water quality parameters. The test number on the 4th column of the table corresponds to the test name on the 2nd column of the table.

Comment: *General comment: Are the projected TP reductions in the ESP basins the same as was predicted in 2003 (LTP, October 2003, Table 4.2)?*

Response: The projected TP reductions presented in Table 4.2 of the LTP of October 2003 are currently being updated. New projected TP reductions are expected to be completed by December 2005.

Chapter 4: Responses to Peer Review and Public Comments

Kathy Pietro

RESPONSES TO PEER REVIEW PANEL COMMENTS

Comment: *This chapter is a well written factual description of the performance, compliance and optimization of the STA. The general performance of the STA in removing P loading is very good. That is, operation of the STA has been a success in that P has been effectively and continuously removed from the water column and stored in the sediment.*

Response: Thank you.

Comment: *The central questions need to be answered now are: What is the main mechanism responsible for the P removal process of STA?*

Response: The STAs sequester phosphorus through peat accretion. Operational experience with the STAs indicates that the primary mechanism controlling STA treatment performance to date is inflow water and total phosphorus loads.

Comment: *And can this P removal process be continuous and effective on a long-term basis? As the experience of operating the STA grows, more data critical to the answers of the above mentioned questions should be available for analysis.*

Response: We believe this to be true. We continue to monitor and evaluate the performance of the STA performance over time.

Comment: *Some descriptions of the STAs need to be clarified. E.g., both STA-1W and STA-2 are in “stabilization phase” but the STA-1W is “partially functional” and the STA-2 is “fully functional”. Does stabilization phase have anything to do with the functionality? If it does, what is the relationship? The STAs are dynamic systems: They change functionally and structurally over time. Those changes are important attributes of the STAs and need to be described accurately along with the discussion on relationships between structural change and functional change of STAs.*

Response: The terms “start-up,” “stabilization phase,” and “post-stabilization phase” refer to operational phases as defined in the operating permits. Clarification of these terms has been included in the text.

Comment: *Other than P, emerging issues such as sulfate and its relationships to Hg bioavailability and P release need to be addressed in more detail in the chapter.*

Response: Appendix 4-4 “Annual Permit Compliance Monitoring Report for Mercury in the Stormwater Treatment Areas” shows time series plots of water column sulfate concentrations

versus stage and rainfall.

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

Comment: *The success of STA indicates that the engineers involved must have done something right in the design and operation of the STAs. A discussion of the philosophy and hypothesis of the design and operation of STAs would be helpful information.*

Response: Web site address to the 1995 Basis of Design paper is listed under the “Summary” section. Additionally, the general operational principles that are performed in the STAs are listed in the “Summary” section of the chapter and the actual long-term average design parameters are listed under the section “STA Performance Synopsis.”

Comment: *Addition of public education and out-reach components to the STA is definitely a plus. Public needs to know their tax dollars are well spent. Children and adults need to be educated in terms of environmental protection and conservation. STA is a unique and great educational show case of ecosystem restoration. More effort should be put in this out reach component. The panel is aware of some student training programs initiated by the District. The effort is commended and all these may be reported in the chapter.*

Response: Public outreach activities, beyond those mentioned in the chapter (duck hunting, bird watching), will be included in future reports.

Comment: *Reference to web sites in the report is a significant improvement of this year’s report. Cross referencing among the chapters needs to be strengthened in the future. Meaningful cross reference could be done by author’s selective editing of an appropriate cross referencing list.*

Response: Thank you.

Comment: *There seems to be a “disconnect” between data that shows large inflows of P into the STAs and what is shown in Chapter 3. More coordination between the two programs is necessary. A resurrection of the TP flow map from previous years is suggested.*

Response: Additional integration between Chapter 3 and Chapter 4 will be provided in future reports.

RESPONSES TO PEER REVIEW PANEL COMMENTS (NEAL ARMSTRONG)

Comment: *It is clear from the information presented that the District is using STAs in an effective manner, that the STAs are performing well overall, that continual attention is being given to the maintenance of these facilities, and that significant research is being done to better understand the performance of each STA and to use that information to improve the design and operation of them all.*

As noted in comments submitted last year, the STAs are essentially wet detention ponds being used to remove phosphorus from flows from the EAA and other areas. For phosphorus, these systems rely on physical, chemical, and biological mechanisms to achieve removal. The mechanisms are affected by flow and volume management in the ponds, dissolved oxygen conditions at the sediment/water interface, and other factors. There is considerable literature information on the principles of detention ponds, their application to stormwater treatment, and their design and operation. It was recommended that the design principles the District uses to

establish these STAs originally and the operational principles being followed to insure their continued performance at levels and efficiencies expected be included in this chapter, and much of that type of information has been added.

Response: Thank you. The web site to the 1995 STA Basis for Design paper is provided in the text. Additionally, the section “STA Performance Synopsis” shows the long-term average design values for each STA in comparison to the actual data. These data are used weekly by the STA operations team.

Comment: *It was also noted that while these STAs are being operated, it seems that information such as hydraulic, organic material, and nutrient areal loading rates, dissolved oxygen concentrations within the STAs, water depths, detention times, and other operational information could be gathered and related to phosphorus removal. Such information would enhance the design and operational basis for these ponds and future ones and assist the District in managing these ponds effectively. This information was being gathered and is presented in some detail in this chapter.*

Response: Agree. Thank you.

Comment: *There is now the opportunity to relate areal loading data to STA TP removal performance, and this can be done for example with the data in Table 4-1. Plotting TP loading rate vs. percent removal of TP, there is a trend of decreasing removal with increasing loading. This trend can be tested with WY2005 TP loadings which were significantly higher than WY2004.*

Response: Agree. This additional analysis was included in the chapter.

Comment: *Based on removal trends shown in Figure 4-45, there is also an opportunity to examine STA TP removal efficiency over time as the sediments reach their sorptive capacity. STA-1W and STA-5 both show consistent trends downward in their ability to remove TP. It is good to see that studies are beginning to look at this possibility (Lines 1815-1825).*

Response: Thank you.

RESPONSES TO PEER REVIEW PANEL COMMENTS (PING HSIEH)

Comment: *This chapter is a well written factual description of the performance, compliance and optimization of the STA. The general performance of the STA in removing P loading is surprisingly good in my opinion. That is, operation of the STA has been a success in that P has been effectively and continuously removed from the water column and stored in the sediment. The central questions need to be answered now are: What is the main mechanism responsible for the P removal process of STA?*

Response: Peat accretion. Operational experience with the STAs indicates that the primary mechanism controlling STA treatment performance to date is inflow water and TP loads.

Comment: *And can this P removal process be continuous and effective on a long-term basis?*

Response: We believe this to be true. We continue to monitor and evaluate the performance of the STA performance over time.

Comment: *As the experience of operating the STA grows, more data critical to the answers of the above mentioned questions should be available for analysis. The task should be achievable in the near future with well-planned research and analysis. Following are my specific comments on the chapter:*

Response: Agree.

Comment: *L84, add “of water” to the end of the sentence.*

Response: Text was changed.

Comment: *L133, Table 4-4, Is there a safety range of parameters build in to the design of the STA? If the answer is “yes”, what are the values?*

Response: Yes. These additional values (90%, maximum) will be added to Table 4-4. The design parameters stated in the chapter are based on the long-term average annual value anticipated during design and considerable annual variability was expected.

Comment: *L166-180, It seems to me that the vegetation management in the STA is geared toward the establishment of SAV. Is SAV more desirable than emergent AV? Is there any explanation to that effect? Also, what is the diurnal pattern of pH and DO associated with SAV establishment and how does that affect the P removal efficiency of the STA?*

Response: Emergent vegetation is encouraged at the beginning of the treatment train where nutrient concentrations are higher; SAV is encouraged in areas further down the flow-path. Research done on STA-1W Cell 4 and in the Advanced Treatment Technology program indicates that SAV can achieve TP outflow concentrations lower than emergent vegetation.

Comment: *L587, Table 4-8, Does the establishment of SVA increase the DO during day light?*

Response: Strong diel pattern of pH and DO exists. Our comparison is on a net basis, using flow or time proportional sampling across the diel cycle.

Comment: *L755, The blank needs to be filled.*

Response: Value was added to the text.

Comment: *L883-889, How does the patchiness of vegetation affect the flow in STA? Is this vegetation factor on flow characteristics being considered in the optimization of STA?*

Response: Yes, we agree. Management operations try to reduce open areas where hydraulic short-circuiting can occur. Annual vegetation maps and tracer studies are some of the tools used to optimize.

Comment: *L1018-1026, STA-3/4 seems to perform very well on P removal. Is STA-3/4 passed the stabilization period? It isn't it just operational not long ago?*

Response: STA-3/4 is currently in the stabilization phase. Eastern Flow-way 1 (Cells 1A and 1B) showed net improvement for phosphorus on 12/24/03 and for mercury on 1/15/04; Central Flow-way 2 (Cells 2A and 2B) showed net improvement for phosphorus on 8/5/04 and for mercury on 8/11/04 and has been in flow-through since 9/16/04; Western Flow-way 3 (Cell 3) showed net

improvement for phosphorus on 12/24/03 and for mercury on 6/29/04, through a permit modification, flow-through operations was authorized on 3/19/04.

Comment: *L1196-1203, What is the goal of vegetation management in STA-5?*

Response: To control emergent vegetation in SAV Cell 2B and floating aquatic vegetation in Cells 1A and 2A. Cell 1B was off-line due to LTP construction but is now in operation and the goal is to convert from emergent to SAV

Comment: *L704, Fig. 4-44, Are those points from just one year's data? How does the figure look if all available data is plotted?*

Response: This plot contains all available data, presented as annual values.

Comment: *Fig. 4-45, The P load removal decreases significantly in recent years in the STA-1W. What is the explanation? Is it due to aging or other factor(s)?*

Response: Factors contributing are: high hydraulic and nutrient loading, damage to SAV due to hurricanes, and floating cattail islands.

Comment: *L1764-1769, As far as I understood, most wetlands are extremely flat. What is the resolution and precision of your vertical survey? mm or cm?*

Response: There were two kinds of surveys done in STA-1E. A complete third order run was made to all the structures. Precision is 0.05 times the square root of the distance in miles. An RTK survey was done for the STA-1E topographic work. Generally to the 0.1 of a foot

Comment: *L1816-1825, It is critical, with regard to the long-term operation of STA, that you find out the main mechanism that controls the P removal in STAs.*

Response: Peat accretion. Operational experience with the STAs indicates that the primary mechanism controlling STA treatment performance to date is inflow water and TP loads.

Comment: *L1815-1848, It is very important and critical to find out the major mechanism that control the P load removal in STAs. The task should not be taken lightly. The answer to the question could have great impacts on the constructed wetland technology and wetland ecology in general.*

Response: Yes, we agree

Comment: *L1863-1866, Why? I thought intense increase in photosynthesis of SAV should increase pH by reducing the dissolved CO₂ in the water column. This pH increase has nothing to do with alkalinity because changing CO₂ concentration in water does not change alkalinity (it changes only pH). Changing cation concentration, such as that of Ca, Mg or Na, does.*

Response: Intense photosynthesis by SAV can remove all free CO₂ from the water resulting in a rise in pH. Plants then begin to assimilate bicarbonate from the water as an alternative carbon source. Wetzel (2001; p. 543) summarizes the sequence of chemical reactions that lead to the precipitation of CaCO₃ on leaf surfaces and the ensuing removal of Ca from the water column. SAV in the STAs is often heavily encrusted with Ca deposits and is a mechanism found throughout the Everglades.

Comment: L1899, Table 4-21, The expression of column 5 (Inflow TP stored in floc, %) is kind of misleading. In a matter of mass balance, I do not understand how can you store 23% more than what you have deposited? (I would like to learn how to play this trick on my checking account.)

Response: Sediment storage is difficult to estimate in wetlands with a high degree of accuracy. In these types of calculations, estimates of sediment storage exceeding inflow loads are not uncommon.

RESPONSES TO PEER REVIEW PANEL COMMENTS (JOANNA BERGER)

Comment: Table 4-1 is very useful, and where possible, similar tables should be presented for other operations aspects (e.g. pesticide and mercury levels).

Response: Thank you. Your comment has been forwarded to the other section leaders.

Comment: What effect did the hurricanes have on pesticide and mercury levels in the STAs?

Response: These data will be reviewed to determine if the impact from the hurricanes is observed.

Comment: References to the web pages to find particular documents is very helpful.

Response: Thank you.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: General comment: The inclusion of what looks like SFWMD program or budget numbers in the text is not meaningful to readers.

Response: The inclusion of the program numbers are included to allow for cross-comparison to the Long-Term Plan project.

Comment: General: We appreciate how many tons of phosphorus have been retained by the STAs. Two of them in particular are performing well right now, and remedial efforts are being made on the STAs not performing well. However, it would be informative to also include data on the phosphorus load leaving the STAs. These data are important to assess the potential impacts on downstream receiving water bodies such as the Refuge.

Response: Outflow flow, TP load, and FWM TP are listed for each STA.

Comment: p. 4-5, line 49: It is clear that events in WY2005 affected STA performance. However, STA-1W in particular was beginning to recover from overloading that occurred in 2002 and 2003, and the effects of WY2005 need to be looked at in the context of previous impacts.

Response: Discussions about the management activities taken in 2004 and the positive response of the wetland are presented in the chapter. In summary, inflows into STA-1W were reduced to allow the STA to recover from the overload event in 2003 and outflow concentrations were reduced. In August 2004, inflows increased because of the hurricanes and outflow TP also increased.

Comment: p. 4-7, line 123: For STA-1W, please include the percent of flow received over the design amount, as was done for the other STAs.

Response: The long-term average annual value anticipated during design compared to the actual data is included for all STAs under the “STA Performance Synopsis” section (previously located in the “Summary” section in the draft version).

Comment: p. 4-8, lines 146-148: This description of inflows for STA-1E does not mention the planned Acme-B diversion to STA-1E. This flow will add an average of 30 to 40 thousand acre-feet of water to this facility.

Response: Text was added to the chapter to address this issue.

Comment: p. 4-13, lines 239-243: It would be helpful to see this bypass flow broken down into monthly totals. Bypass in July was water supply makeup water. Bypass in September and October were related to the storms. This suggested table is shown below:

Table 2. Total monthly bypass flow at G-300 and G-301 gates.

<i>Month-Year</i>	<i>ac-ft</i>
<i>May-04</i>	<i>0</i>
<i>Jun-04</i>	<i>1</i>
<i>Jul-04</i>	<i>4,878</i>
<i>Aug-0</i>	<i>41</i>
<i>Sep-04</i>	<i>40,839</i>
<i>Oct-04</i>	<i>10,914</i>
<i>Nov-04</i>	<i>0</i>
<i>Dec-04</i>	<i>0</i>
<i>Jan-05</i>	<i>0</i>
<i>Feb-05</i>	<i>0</i>
<i>Mar-05</i>	<i>12,431</i>
<i>Apr-05</i>	<i>0</i>
<i>Grand Total</i>	<i>69,064</i>

Response: Monthly by-pass flows are included in the STA-1W Recovery Plan in the table format suggested. The web address is listed in the chapter.

Comment: p. 4-13, line 277: there is extra ‘in’, “...inflow into **in** Cell 5....”

Response: Text was corrected.

Comment: 4-13, line 265: Category 1 storms, not category 4.

Response: Text was corrected to reflect that Hurricane Frances was a Category 2 storm and Hurricane Jeanne was a Category 3 storm.

Comment: p. 4-13, line 282: "...concentrations ...was high," change to..."concentrations...were high,"

Response: Text was corrected.

Comment: p. 4-13, line 283: "instead of discharged" change to "instead of **being** discharged"

Response: Text was corrected.

Comment: p. 4-14, line 330: This statement is misleading in that it implies that once STA-1E is online, STA-1W will no longer be overloaded with water and phosphorus. Please clarify this statement to include the ongoing overloading that will be experienced by STA-1W until the L-8 Basin water can be diverted, or until other corrective measures can be taken.

Response: Text will be added to the chapter to address this issue. The STA-1E operations plan is being developed within the permit time frame.

Comment: p. 4-X, line 335: Water supply deliveries assume that bypassed water in the canal remains in the canal during low canal stages relative to marsh stages. A major concern, however, is that once nutrient-rich water is in the canal (resulting from a water supply bypass), a subsequent rainfall and discharge event can move that canal water into the Refuge interior before it is discharged out of the canal for water supply purposes.

For example, a water supply-related bypass began on July 4, 2004 and continued through July 17, 2004. This bypass totaled 4.9 thousand acre-feet (212 million cubic feet). The total volume of the L-40 Canal from the G-300 bypass gate to the G-94B and G-94A water supply gates (assuming 700 square foot cross-section) is 62.8 and 74.9 million cubic feet, respectively. Total bypass volume did not equal the canal volume to the G-94B gate until July 10; the first 6 days of water delivery supplied water already existing in the Refuge – water that had been already (needlessly) treated or entered the Refuge as rainfall. Water bypassed over the final 5 days remained in the L-40 Canal. The G-300 grab sample total phosphorus was 147 and 118 on July 8 and 22, respectively. Thus, the water supply bypass that remained in the L-40 canal was above 100 ppb as the rainy season began in August. This may have contributed to the elevated phosphorus concentrations at the Consent Decree compliance sites observed in August 2004.

Comment: p. 4-16, line 414 and P4-322 and line 755: the TP amount from Lake Okeechobee is missing.

Response: This value was included in the text.

Comment: p. 4-21: It would be helpful in Table 4-6 to either show the criteria or add an extra column indicating compliance.

Response: This field will be added to the table in future reports.

Comment: p. 4-23, Figure 4-8: Legend unreadable.

Response: The legend was made legible.

Comment: p. 4-24, lines 553-555 and P4-25, lines 577 to 580: More explicit explanations are needed. How does the result of the DO comparison between discharges and downstream Refuge

marsh sites indicate whether the discharge affects the DO in the marsh? Is it true that if they are equal the discharge affects the marsh DO, and if they are significantly different the discharges do not affect the marsh DO? Is it normal to have a lower DO concentration at the edge and a higher DO concentration at the internal locations, as shown by the measured data in Loxahatchee Refuge and Rotenberg WMA?

Response: Thank you for the observation. We continue to evaluate water management options in regard to this issue. We will review the text to determine if we can be more explicit.

Comment: *p. 4-32, line 747: Need to update STA-1E status.*

Response: Text was updated to reflect the most current operational status of STA-1E.

Comment: *p. 4-35, line 784: typo in "...outflow that at the combined inflow..." change to "...outflow than at the combined inflow..."*

Response: Text was corrected.

Comment: *p. 4-35, line 784-785: How does the fact that sulfate has no applicable numeric state quality standard lead to the compliance of the STA-2 with the permit? I did not see the logic. Are you referring to only sulfate? What about other parameters?*

Response: The water quality parameters with Florida Class III criteria are dissolved oxygen, specific conductance, pH, turbidity, unionized ammonia, alkalinity, and total iron. The text in the chapter points out that outflow concentrations of sulfate are higher than inflow concentrations but these parameters are not one of the specified compliance parameters.

Comment: *p. 4-41, line 883: The six-day and one-day references seem to be in conflict. How could the peak be observed after one day if it took six days for the tracer to reach the outflow structure.*

Response: The 1-day reference pertains to the highest concentration of tracer observed at the outflow. The 6-day refers to the time it took to recover 95% of the tracer. Text will be clarified to reflect this.

Comment: *p. 4-36, Table 4-9: The arithmetic mean concentration of the DO at the outflow of G335 is 4.8 mg/L in Table 4-9, however, it is 5.84 [mg/L] in Table 4-11. Do they refer to DO at the same location?*

Response: The DO value listed in table 4-9 reflects the DO measured when grab samples are collected; Table 4-11 show the DO measured quarterly for 1 week for 0.5 hour intervals.

Comment: *p. 4-45, line 1006: Is it really a one-mile radius?*

Response: No. The text was corrected to one-meter instead of one-mile.

Comment: *p. 4-58, lines 1266-1267: Is there any additional information as where ametryn and atrazine came from? Are there any data in the inflow? What is the background value?*

Response: These chemicals are not used in the District's vegetation management practices. Table 4-13 shows both inflow and outflow concentrations. Ametryn and atrazine are commonly used in agriculture.

Comment: p. 4-65, Section "STA-5 ENHANCEMENTS": I was told by SFWMD personnel that the pump G507 was used sometimes. Why it is not shown in Figure 4-25 or mentioned in this section?

Response: G-507 is a water supply pump and was last used on 6/2/04 (1 month into the water year). The amount pumped through G-507 during WY2005 will be posted in the text.

Comment: p. 4-71: Figure 4-37 is out of date. Is structure G606 still running? In Figure 4-37, G604 and G603 appear to be discharging into Cell3, while only G603 does.

Response: G-606 is no longer in operation and will be deleted from the schematic. Only G-603 discharges into Cell 3. For irrigation purposes, water can be moved from the south section of the supply canal through five culverts equipped with upstream flow gates (G-604).

RESPONSES TO FDEP COMMENTS

Comment: Chpt. 4 Page 4-3 – In the table, "TP Outflow to Date" gives the illusion that it is a cumulative number. An additional footnote containing an explanation on how TP Outflow to Date is calculated might be appropriate here.

Response: In Table 4-1, the "TP Retained to Date (mt) and TP Outflow to Date (ppb)" does reflect a cumulative number. The footnote was clarified.

Comment: Chpt. 4 Page 4-4 – Update STA-1E Operational Status (facility is now permitted).

Response: Text was updated to reflect the most current operational status of STA-1E.

Comment: Some clarification needed as to why STA-2 is considered "fully operational" if it is in the stabilization phase. Other facilities in the stabilization phase are considered partially operational.

Response: The terms "fully operational" and "partially operational" reflect how many of the treatment cells are operational. The term "partially operational" is applied to those STAs that have treatment cells off-line for Long-Term Plan enhancement construction or vegetation treatment rehabilitation. Text was added to the figure legend.

Comment: STA-3/4, last sentence says 3/19/04. Previous page says ended in 02/04, please revise accordingly.

Response: Text was changed.

Comment: Chpt. 4 Page 4-8 – Please revise the last sentence of the second paragraph to reflect the present status of STA-1E. (facility is now permitted).

Response: Text was updated to reflect the most current operational status of STA-1E.

Comment: Chpt. 4 Page 4-16 – Please update place holder for metric tons of TP from Lake O releases.

Response: This value was included in the text.

Comment: *Chpt. 4 Page 4-32- Please revise the last sentence of the second paragraph to reflect the present status of STA-1E. (facility is now permitted)*

Response: Text was updated to reflect the most current operational status of STA-1E.

Comment: *Chpt. 4 Page 4-32 – Please update place holder for metric tons of TP from Lake O releases.*

Response: This value was included in the text.

Comment: *Chpt. 4 Page 4-71 – Please revise the first sentence of the second paragraph. U.S. Sugar no longer operates the G-600 pumping station.*

Response: Text was added.

Comment: *Chpt. 4 Page 4-83 –Please revise the second and third sentence of the second paragraph to reflect the present status of STA-1E. (facility is now permitted)*

Response: Text was updated to reflect the most current operational status of STA-1E.

Comment: *Chpt. 4 Page 4-92 – Table- Please provide an explanation for negative depths and HRT.*

Response: The negative values listed for STA-1W Cell 2 for WY2005 and for STA-2 Cell 1 for WY2002 and WY2003 reflect when the water depth in these treatment cells were manipulated due to start-up conditions of implementation of Long-Term Plan enhancement construction. Text was added.

Comment: *Chpt. 4 Page 4-97 – Table- Please provide an explanation as to how inflow TP stored in floc can exceed 100% (e.g. 123%)*

Response: Sediment storage is difficult to estimate in wetlands with a high degree of accuracy. In these types of calculations, estimates of sediment storage exceeding inflow loads are not uncommon.

Comment: *Appendix 4-3 – Please provide a signed statement of authenticity concerning the sampling program and analytical program for STA-3/4.*

Response: The signed statement of authenticity concerning the sampling program and analytical program for STA-3/4 was included in the appendix.

Comment: *Appendix 4-2 – Missing. Department unable to provide informal comments at this time.*

Response: The appendix section “Annual Permit Compliance Monitoring Report for Mercury in the Stormwater Treatment Areas” was forwarded to the FDEP as soon as it was available.

RESPONSES TO GARY GOFORTH**GENERAL COMMENTS**

Comment: Overall, this was a very informative and comprehensive chapter – good job.

Response: Comment appreciated.

Comment: Where references are made to design averages (e.g. Table 4-4 and in each STA section), please include mention of “long-term average annual value anticipated during design” and “considerable annual variability was expected”. The key point is that the long-term average annual values anticipated during design are not an annual maximum limit – and are not expected to occur each year, and should not be compared to each and every annual value. You may want to include period of record average annual values (flow, load) for more of an apples-to-apples comparison with the long-term average annual values anticipated during design.

Response: The references to design averages were clarified. The period of record average annual values were added to the table.

Comment: Clarification and consistency is needed about cells taken off-line temporarily for enhancement and repairs, otherwise 3rd parties can misinterpret this. Many tables and figures use this information, somewhat inconsistently, and clarification is needed in the text; suggest deleting descriptions of flow-ways of-line in figure and table headings.

Response: The temporary closing of treatment cells for enhancement construction and repairs was emphasized. Consistency was checked throughout the text. The temporary flow-way closures will remain as footnotes on the relevant tables and figures.

Comment: Vegetation Management sections give the impression that herbicide application is the District’s primary means of vegetation management; suggest each section begin with a description of target vegetation communities, measures to encourage those communities (e.g., water level management and how the District changed the target depths in the STAs to be more conducive to the target vegetation), and then talk about herbicide applications.

Response: All of the vegetation management activities were added to the text.

Comment: Please use “diversion” instead of “bypass” (e.g., p 4-65 line 1360) as there is regulatory distinction between the two terms (“bypass” is not authorized!)

Response: Text was modified.

Comment: Please confirm that the comparisons of inflow to outflow water quality are lagged by one month, as required by the permits.

Response: The water quality tables are not lagged by one month; annual values are presented for the water year. The monthly reports that are submitted full-fill the permit requirements.

Comment: The footnote giving conversion between hm3 and acre-feet is unnecessary; many times the footnote is incomplete (e.g., p 4-30).

Response: The footnote will remain on Tables 4-18 and 4-20 where the data is presented as hm3.

DETAILED COMMENTS

Comment: p 4-1 2nd sent: mention COE completed construction of over 6,000 acres of treatment wetlands

Response: Text was added.

Comment: p 4-1 lines 15-19: when describing total STA characteristics, suggest use “averaged” or “an average of”

Response: Text was added.

Comment: p 4-4: STA-1E needs a description of construction completion; permit issued, net improvement demonstrated, hurricane damage repairs almost complete.

Response: Text was updated to reflect the most current operational status of STA-1E.

Comment: STA-3/4 delete majority of text under Operational Status as it is WY2004 info, and replace with WY2005 info; mention diversion

Response: The text reiterating the operational status in WY2004 was removed and WY2005 information was added. Diversion values were included.

Comment: p 4-5: line 50: add “short-term” in front of “reduction” – this should be repeated throughout chapter where reduction in area is referenced.

Response: This clarification was included when reduction in area was referenced.

Comment: Line 57: mention STA-3/4 also

Response: STA-3/4 was added to the sentence.

Comment: p 4-6 Table 4-3: why is this table in the summary? Herbicide use is not a key issue – it is a maintenance issue and doesn’t warrant mention in the Summary.

Response: The herbicide application table was added in response to the comments received from the Peer Review panel.

Comment: p 4-6 Table 4-4: “Actual” effective treatment areas need footnote that reductions are temporary. Half of the information in this table is a duplicate of table 4-1 and the other half is duplicated in the text of each STA – which suggests this table is unnecessary?

Response: The table showing the actual data compared to the long-term average design value was moved from the Summary section to the STA Performance Synopsis section.

Comment: p 4-8: Corps has testified that the STA-1E was completed in June 2004; suggest you use that date.

Response: The date correction was made.

Comment: p 4-9 lines 166-180: no mention of efforts to encourage SAV by water level manipulation and other means

Response: Inclusion of water level manipulation to encourage SAV growth was added to the text.

Comment: p 4-10: same comment as above in discussion of start-up

Response: Inclusion of water level manipulation to encourage SAV growth was added to the text

Comment: p 4-10: missing a description of the start-up water quality monitoring! Discuss this, demonstrated net improvement for central and western flow-way, and received permits!

Response: Water quality data was included in the chapter, along with an update of the permit status.

Comment: p 4-13: lines 248-256: delete this section – it is old news and was discussed in previous annual reports.

Response: This section was not deleted because it lists the management steps implemented to encourage STA revitalization and the activities occurred in the water year reported on.

Comment: line 265: were the hurricanes Cat 4's or Cat 3's?

Response: Text was corrected to reflect that Hurricane Frances was a Category 2 storm and Hurricane Jeanne was a Category 3 storm.

Comment: lines 272-275: was the PBA contribution significant? If not (and I haven't seen data suggesting it was), suggest omitting this text

Response: Information about the breach at the Palm Beach Aggregates was not omitted because high TP concentrations (over 500 ppb) along with pumping resulted in a noticeable loading increase into STA-1W.

Comment: line 276: suggest adding “after the hurricanes” after “as soon as possible”.

Response: Text was added.

Comment: p 4-14 and 4-15 lines 301-345: suggest deleting this section - it is old news and was discussed in previous annual reports – only mention WY2005 actions

Response: The management actions prior to WY2005 were still included in the chapter, but were not emphasized as much as they were in the draft report.

Comment: p 4-16: line 414 – see general comment on Lake releases to STA-1W.

Response: The correct amount of phosphorus loading from Lake Okeechobee has been added to the text.

Comment: Suggest a discussion of temporary effective treatment area reductions that formed the basis of values in Table 4-1 and 4-4?

Response: Agree. Text was added.

Comment: p 4-30: suggest 1-2 sentence summary of tracer test – number of tanks in series - particularly since this may be a reason to not build the proposed levee in Cell 3!

Response: The paragraph discussing the tracer study was deleted in this section

Comment: p 4-31 and 4-32 lines 727-743: suggest deleting as info is outdated.

Response: Agree. This information about permit history was deleted.

Comment: p 4-41: need key results of tracer test – number of tanks in series - particularly since this may be a reason to not build the proposed levee in Cell 3! Hydraulic efficiency?

Response: Agree. Key results of the tracer test were included in this section.

Comment: p 4-46 lines 1008-1016: results? What was learned? What will be applied to other large-scale conversion from emergent to SAV?

Response: The linkage between the SAV inoculation project and the applicability to other large-scale conversions was added to the text.

Comment: p 4-47 footnote to Figures 4-21 through 4-23: delete discussion of cells off line – clarify and add to text.

Response: The footnote was not changed, but additional verbiage was added to the text to further clarify.

Comment: p 4-49: lines 1055-1080: needs to be rewritten to focus on wy2005 info – much is a repeat of wy2004 info.

Response: The text was modified to present WY2005 status only. The historical timeline pertaining to the permit activities involved with STA-3/4 was still included in Table 4-2 “Summary of STA operations and issues”.

Comment: line 1095: what is meant by this sentence? I didn’t see anything in the permit that provides for just one low-way to be used for compliance.

Response: Text was clarified to indicate that only Flow-way 1 was operated for the entire water year, although the water quality data was shown for all monitoring stations in Table 4-12.

Comment: p 4-50 Table 4-12: delete description of flow-ways off-line from header and put in text.

Response: The description of the flow-ways off-line was included in the text, and moved from the table header and placed into the table footnote.

Comment: How is it that with an STA discharging over 640,000 AF that only approximately 33% of the outflow samples were taken when there was flow?

Response: The sampling frequency will be investigated.

Comment: p 4-51 line 1122: suggest deleting reference to levee number and instead use cell reference.

Response: Agree and the text was modified.

Comment: p 4-54: line 1173: suggest deleting “high”.

Response: Agree. The word “high” was deleted.

Comment: line 1174: “119.910” sb “119,910”.

Response: The correction was made to the text.

Comment: p 4-55 lines 1210-1224: not enough is said about the good news that STA-5 had significantly lower TP outflow than last year! Trend is good – possibly due to BMP implementation in upstream basin.

Response: Agree. Additional verbiage was added to emphasize the improved performance observed at STA-5.

Comment: p 4-59 Table 4-13: delete description of flow-ways off-line from header and put in text.

Response: The description of the flow-ways off-line was included in the text, and moved from the table header and placed into the table footnote.

Comment: Why is atrazine higher in outflow than in inflow at STA-5?

Response: Text was added to indicate that this chemical is not used in the District’s vegetation management practices. Ametryn and atrazine are commonly used in agriculture.

Comment: p 4-65: line 1342: wasn’t this the 3rd year for hunting?

Response: Yes, and the text was corrected.

Comment: Line 1359: replace “lead” with “contributed” as higher flows was the main factor for diversion.

Response: Agree. The text was modified.

Comment: p 4-48 Table 4-17: clarify that a lot of water quality sampling was conducted in STA-1E for start-up monitoring.

Response: Text was added to clarify.

Comment: p 4-86 line 1815: mention why STA-3/4 was not included in this discussion.

Response: Text was added to explain that STA-3/4 was not included in the “Analysis and Interpretation [Bc82(4)] section because the STA had only been operational for one year.

Comment: p 4-87 line 1857: suggest mentioning that G-307 is being constructed to help alleviate this short-circuit.

Response: Agree. Text was added.

Comment: p 4-89 Table 4-18: Excellent summary!!! The rest of Ch 4 uses acre feet – this table uses hm3 Suggest it be converted to acre feet for consistency.

Response: Consistent units will be used in future reports.

Comment: *Can STA as a whole averages be presented in Table 4-18?*

Response: Inflow and outflow to the entire STA is presented in Table 4-1 for WY2005, and in the figures shown in Appendix 4-2, “Individual STA Performance Time Series Plots for STA-1W, STA-2, STA-5, and STA-6”. The value for the entire STA will be presented in future reports.

Comment: p 4-92 Table 4-19: Excellent summary!!! The rest of Ch 4 uses feet – this table uses meters. Suggest it be converted to feet for consistency.

Response: Consistent units will be used in future reports.

Comment: *Can STA as a whole averages be presented?*

Response: Hydraulic residence times for the entire STA is presented in Table 4-1 for WY2005. The value for the entire STA will be presented in future reports.

Comment: *p 4-94 Table 4-20: Excellent summary!!! Can STA as a whole averages be presented?*

Response: The value for the entire STA will be presented in future reports.

Comment: *p 4-104: line 1956: reference to Goforth 2005 should be Goforth et al. 2005 and line 1968: reference to Goforth should be Goforth et al. 2005.*

Response: Changes were made to the text.

Chapter 5: Responses to Peer Review and Public Comments

Wossenu Abteu

RESPONSES TO PEER REVIEW PANEL COMMENTS

Comment: *Chapter 5 presents an excellent overview of South Florida's hydrology for WY 2005. The year's extreme hydrologic events challenged the authors of Chapter 5, but the description is well developed and documented.*

Four hurricanes impacted South Florida in WY 2005 but the average rainfall was below average! The timing of the rainfall varied greatly over the year and District area.

Response: Although the water year rainfall was below average, the spatial and temporal distribution of the rainfall had impact on water management as much as the magnitude. In addition, pre- and post-hurricane hydrology becomes part of the resulting water management.

Comment: *Is documentation for the SFWMD hydrometeorologic monitoring presented in the report by Crowell and Mtundu (2000)? The title of the reference is noted as being QA/QC, not a full monitoring program design, thus the question. Is the hydrometeorologic monitoring design based on regulation schedules (line 1121-1123) that guide operation of the pump facilities? Has the hydrometeorologic monitoring design been peer reviewed? How does one access the design? Does the design describe the monitoring network (measuring where, when, and how)? Or are there multiple designs, each project with its own hydrometeorologic network?*

Response: The District-wide rainfall and weather stations network is a result of traditional monitoring network where the monitoring network design did not precede the monitoring network. A series of network reviews or evaluations have been done in the past and there are also studying currently in progress. The following reports are available in the District Reference Center or can be acquired from Dr. Chandra Pathak in Operations and Hydro Data Management Division at the District.

- Assessment of the Rain Gage Network in the South Florida Water Management District. – September 1994
- Assessment of the Evaporation Pan Network in the South Florida Water Management District - 1995
- Testing the Adequacy of a Kriging Model of the SFWMD Rain Gage Network – July 1996
- Enhancement of Stage Monitoring Network for Greater Everglades Wetland Areas – 2004
- Pilot Study for Flow And Stage Network Optimization Study – 2005

- Rain Gage Network Optimization Study for the South Florida Water Management District – on-going study and to be completed March/April 2006

There are project based network designs such as the Everglades Nutrient removal Project. Three peer-reviewed Journal publications related to network analysis and design are:

- a) Abtew, W., J. Obeysekera and G. Shih. 1993. "Spatial Analysis for Monthly Rainfall in South Florida". Water Resources Bulletin. Vol. 29(2):179-188.
- b) Abtew, W., J. Obeysekera and G. Shih. 1995. "Spatial Variation of Daily Rainfall and Network Design." Transactions of ASAE. Vol. 38(3):843-845.
- c) Ali, A., W. Abtew, S. Van Horn and N. Khanal. 2000. "Temporal and Spatial Characterization of Rainfall over Central and South Florida." Journal of the American Water Resources Association. Vol. 36(4):833-848.

Comment: *Why are the outflows of Lake Okeechobee for WY 2004 and 2005 so much above average (2,832,700 ac-ft and 2,617,958 ac-ft, respectively, compared to the historical annual average of 1,445,558 ac-ft) when the rainfall for WY 2004 and WY 2005 is close to average? Is it due to the timing of the rainfall over the water year?*

Response: Temporal and spatial rainfall distribution affects Lake Okeechobee's inflows and outflows. Rainfall on the Lake Okeechobee watershed affects lake stage more than farther downstream. Rainfall in Upper Kissimmee Rainfall Area was significantly above average during the last water years. Antecedent lake stage affects discharge rates. Regulation schedules and water management decisions affect discharge rates from the lake. Also, conveyance limitations affect lake discharge rate.

Comment: *Did the ENP flows in WY 2005 satisfy the 'Rain-Driven Water Deliveries Plan'?*

Response: Chapter 6 "Ecology of the Everglades Protection Area" could address this.

Comment: *Conclusions*

The South Florida Water Management District manages water quantities, as well as related attributes such as water quality and ecosystem health. It appears that water quantity management (i.e., water supply and flood control) are the core operations of the District. Thus, Chapter 5 is a key description related to the core function of the District. Furthermore, a number of times during the discussion in 2C there are explanations of the extreme hydrologic events and the impacts they had on P concentrations. Unfortunately, Chapter 5 is where the explanation of the hydrologic events is presented. In reviewing the two chapters, it was necessary to read Chapter 5 first. In support of putting more logic into the sequencing of the chapters, would it be possible to move the hydrology discussion before the water quality findings are presented?

Response: The Workshop agenda is changed and Chapter 5 will be presented ahead of Chapter 2 and the other chapters.

Comment: *This year's chapter is well written and contains a lot of useful information available to various users. For example, Fig. 76 is a great summary for a large part of the chapter and would be very useful to many end users. One important piece of information that was missing in the chapter was the Mean Residence Time (MRT) of the surface waters. I imagine that the MRT of various part of the EPA would be quite different. Significant variations in MRT of surface water could explain many phenomena observed in the EPA. Understand that the MRT of various parts of an area could also provide important clues for understanding flow anomalies and improved management practices. Determining the MRT may be a difficult task though. Tracer studies such as that conducted in the STA may be able to help solve the problem.*

Response: Computing Mean Residence Time for various parts of the EPA is a useful and complex analysis which will be considered in next year's report.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: *1) General: This chapter on Hydrology summarizes well some of the major surface water components of the hydrologic cycle (rainfall, evapotranspiration, surface- and ground-water levels, and surface-water flows) within the geographic boundaries of the South Florida Water Management District. However, the report fails to discuss the major characteristics or trends of the water-supply/water use/water withdrawals component which drives critical water management issues in the south Florida environment. If these issues on water supplies and the impact they have on the south Florida environment are discussed in other chapters of the 2006 South Florida Environmental Report, the reader should be referred to those other chapters.*

Response: Chapter 5 does not include water supply/water withdrawal and water management decisions. Volume II for water year 2006 is not yet posted, but in last water year, Chapter 7 covers "district Water Management Plan".

Comment: *2) General: I read through Chapter 5 "Hydrology of the South Florida Environment" and only have a few minor comments/suggestions. Many of them may appear to be the usual petty comments that we are trained to look for at the USGS. Overall, it is a nice compilation of the hydrology of the region with sections on the hydrologic variability and the unique 2004 hurricane season.*

Response: Thank you for the complement.

Comment: *3) General: It is important to note that despite the very dry conditions prior to August 2004, August was a wet month, at least in the Refuge. This was not hurricane-related rainfall, but this rainfall did set wet antecedent conditions for the storms in September. It should be stated explicitly that the hurricanes did not result in an exceptional rain in September for the Refuge. There is some uncertainty because of missing data that must be estimated from the central Refuge LOXWS weather site, however, rainfall in the Refuge in August was roughly 11 inches and roughly equal to rainfall in September. From Table 5.1, this rainfall is around a standard deviation above the mean – certainly not an exceptional event.*

Having said this does not imply that the hurricanes were not without impact in the Refuge, including a large amount of inflow from upstream basins. Significant wind damage occurred, as documented in tree island damage surveyed after the storms (Ugarte et al. 2005; USFWS 2005).

Response: In Table 5-5, areal rainfall over WCA-1 and 2 is shown for August and September 2004. In both months rainfall over WCA 1 & 2 was above average (<10-year return period). In

the report, it is not stated that an exceptional rainfall has occurred on the Refuge. It is correct that the hurricanes have created a large amount of inflow from upstream basins.

Comment: 4) *General: Captions of tables and charts are not adequate to understand the figures without referring to the text. In most publications, it is required that the figures and tables can “stand alone” without such searching in the text body for information. For example, Table 5-4 does not say that the value is the 5-day maximum, and does not identify what the value in parenthesis is (I assume this is return period in years).*

Response: We agree with your comments. Caption for Table 5-4 is edited including the phrase “five-day rainfall”. Return period is shown as a footnote of the table “* Return Period in years”.

Comment: 5) *General: It would be very helpful to the reader to mark the dates of passage of each hurricane on the time plots in the chapter. As a reader, this was the first thing I did with a pencil on each plot of interest.*

Response: As pointed out, dates of hurricane passage will be added on the hurricane path.

Comment: 6) *General: This chapter clearly represents a large effort and compiles much valuable information. I do believe that somewhere in the SFER, probably in this chapter, a review of recorded hurricane wind speed and damage to trees and other ecological resources should also be summarized.*

Response: Probably this fits Chapter 6, “Ecology”.

Comment: 7) p. 5-1, l. 39: *What is an ecological drawdown? Do you mean that water levels were lower than the previous water year?*

Response: The term “ecological drawdown is referring to the 2004 lake drawdown for ecological improvement. The phrase “except for Lake Tohopekaliga which had an ecological drawdown the previous year” is now deleted as it does not add new information.

Comment: 8) p. 5-2; l. 98, *editorial suggestion: water supply and coastal discharges to the east and the west. The major hydrologic components comprise of are the Upper Kissimmee Chain of Lakes, the Lower Kissimmee, Lake Okeechobee...*

Response: Sentence is edited as follows “The major hydrologic components comprise the Upper Kissimmee ...”

Comment: 9) p. 5-3, l. 95: *Can you either remove environmental enhancement or define it?*

Response: “environmental enhancement” is now changed to “environmental restoration”.

Comment: 10) p. 5-3; ll. 102-103, *technical correction:Gentry, Lake East Tohopekaliga, Lake Tohopekaliga, and Lake Kissimmee) are the principal sources of inflow to the Kissimmee River Lake Okeechobee. On the average, 48 percent of inflow into Lake...*

Response: Correction made.

Comment: 11) p. 5-3, l. 93: *Figure 1 needs to show the geographical references of Orlando and the Florida Keys.*

Response: Changes will be made.

Comment: 12) p. 5-3, ll. 116-124, *technical question: If 10 percent of the Lake Okeechobee outflow (equivalent to 140,000 ac-ft) flows through the EAA, how come the EAA discharges 900,000 ac-ft of water (about 6 times more) into the EPA? Where is this water coming from?*

Response: The EAA is the main source of surface water for the EPA. The water comes from EAA runoff. Please see details in Appendix 5-3, which presents monthly inflows and outflows by structure.

Comment: 13) p. 5-3, l. 136: *You define emergency management but why not define obligations as well, how do they differ from agreements?*

Response: “agreements, obligations” is now changed to “commitments”.

Comment: 14) p. 5-4, l. 142: *DBHYDRO also stores data for the Fish and Wildlife Service (ARM Loxahatchee National Wildlife Refuge, particularly).*

Response: In the DBHYDRO hydrologic database (excluding water quality) there is “Agency” (source of data) list. This report is presenting only hydrometeorology data sources as listed in DBHYDRO.

Comment: 15) p. 5-6, l. 154: *impoundments should be impoundment.*

Response: Changes are made.

Comment: 16) p. 5-6, ll. 155-157, *editorial suggestion: Excess surface water is discharged to the coast. While surface and groundwater storage modulates short-term variations in rainfall and water supply, there has been experience of droughts where wetlands dried and lake levels were significantly drawdown droughts have dried wetlands and lowered lake levels significantly. On the other extreme, wet...*

Response: Changes made.

Comment: 17) p. 5-6, ll. 159-161, *editorial suggestion: prevail. The dry season extends from November through May and on the average 35 percent of District rainfall occurs in this season. The percentage of dry season rainfall varies from rainfall area to rainfall area among rainfall areas (Figure 5-2) with the highest in Palm Beach rainfall area (39 percent) to the....*

Response: In order to have fewer “rainfall area” terms in the sentence, the original sentence is preserved.

Comment: 18) p. 5-6; ll. 189-192, *editorial suggestion: District area is shown in Figure 5-3 by region (rainfall area). The source of Annual rainfall statistics (Ali and Abtew, 1999a) includes for all areas except the Big Cypress Basin and WCA-3, which are obtained from the meteorological analysis section of the District’s Operations Control, Engineering and Vegetation Management Department. The annual basin rainfall for the ENP was ...*

Response: The sentence is reworded with addition of only “rain” as “...includes all rain areas except...”

Comment: 19) p. 5-7, l. 197: *Didn't know which SFWMD report was being referenced - use the “a” or “b” for similar report references in the same year.*

Response: The reference (SFWMD) is now changed with the actual source of data, the SFWMD website (http://www.sfwmd.gov/org/omd/ops/weather/site_frm.html).

Comment: 20) p. 5-7, ll. 199-200, *editorial suggestion: Palm Beach rainfall area has the highest rainfall while the Lower Kissimmee and Lake Okeechobee rainfall areas have the lowest rainfall. Historically, the Palm Beach County rainfall area...*

Response: Sentence edited as commented.

Comment: 21) p. 5-9, ll. 227-228, *editorial suggestion: area of the South Florida Water Management District has experienced tropical systems at a rate of two every three-years period (Abtew and Huebner, 2000).*

Response: Sentence is edited as “...at a rate of two every three years...”

Comment: 22) p. 5-9, ll. 240-242, *editorial suggestion (add commas): seasonal limitation to moisture have reduced evapotranspiration. Spatial variation of potential evapotranspiration or evaporation from wetlands and lakes over South Florida, as estimated by Abtew et al. (2003), is depicted in Figure 5-4. Generally evapotranspiration increases from north...*

Response: Commas added as commented.

Comment: 23) p. 5-11, ll. 274-275, *editorial suggestion (add plural form): Point and areal temporal variation of rainfall amount is an indicator of hydrologic variation. Lake water levels, groundwater levels, and stream flow rates are directly related to rainfall amounts.*

Response: Edited as commented.

Comment: 24) p. 5-12, ll. 284-286, *editorial suggestion (replace commas by semicolons): temperature, field capacity, and weather trends to compute an index value. Near normal conditions are represented by an index value between ± 0.49 ; severe drought has an index value of -3 or less; and extreme drought events have -4 or less. The historical PDSI for Florida Climatic...*

Response: Changes made as commented.

Comment: 25) p. 5-13, l. 305, *editorial suggestion (missing article): 3,620,483 ac-ft during an El Niño year in 1998. The Arbuckle Creek is an unregulated inflow to Lake Istokpoga. Flow records from 1940 to 2004 depict temporal hydrologic variation in South...*

Response: Changes made as commented.

Comment: 26) p. 5-17, ll. 353-354, editorial suggestion (add time period): hurricanes Charley, Frances, Jeanne, and Ivan on the South Florida Water Management District area during 2004. Based on available data, the spatial distribution and the magnitude of rainfall from the...

Response: Changes made as commented.

Comment: 27) p. 5-17, l. 362: Reference?

Response: Reference added.

Comment: 28) p. 5-17, l. 371: Why not just state the number of hurricanes and the number of tropical storms?

Response: Since definite number is not known, it is better to leave the phrase “about half” as is.

Comment: 29) p. 5-17, l. 372: What are you trying to say about decreased interest and decreased hurricane impacts?

Response: The sentence is edited to read “as the spatial area of interest decreases” It means, the probability of a small area in the geographic location being hit by a hurricane is smaller than a large geographic area.

Comment: 30) p. 5-17, l. 374: It is not clear if you are counting hurricanes and/or tropical storms twice, please clear this up.

Response: The 9 tropical cyclones are listed separately as unknowns in regards as to how many were hurricanes or tropical storms.

Comment: 31) p. 5-27, l. 438: Higher and lower point rainfall readings at single rain gauge stations were observed..., Higher and lower than what?

Response: at the end of the sentence ... “compared to the rain area average rainfall” is added for clarity.

Comment: 32) p. 5-27, Figure 5-14: What is the rationale for combining WCA1 and WCA2?

Response: WCA1 and WCA2 are grouped for areal rainfall calculation in the District Operations web site. I think the reason is convenience of area rainfall computation for two relatively small areas based on the rainfall gauges network in and around WCA 1 and WCA 2 and the Theissen method.

Comment: 33) p. 5-30, Table 5-4: Why was the same rain gauges used for same site presentation in this analysis?

Response: The Theissen method of average rainfall for each rain area has a lot of gauges common to many rain areas that are close to each other.

Comment: 34) p. 5-31, l. 475: How are the return-periods calculated or estimated?

Response: Reference for the 5-day rainfall frequency (return period is given on line 471), (MacVicar, 1981).

Comment: 35) p. 5-32, l. 489: *The sentence is confusing. Was the record high a goal, was Lake Okeechobee aspiring to reach this high daily discharge? The way it is presented it sounds like Lake Okeechobee had goals and objectives.*

Response: The word “attained” is changed to “reached”.

Comment: 36) p. 5-32, Figure 5-18: *On the y-axis are the decimal points necessary? They are not consistent with the other graphs.*

Response: Decimal will be removed.

Comment: 37) p. 5-32, Figure 5-18: *What percent of the water loaded in Lake Okeechobee was not from the S68 and S65?*

Response: Both S68 and S65 do not directly flow into Lake Okeechobee. S-65 discharge has to pass through Kissimmee River (some being intercepted) the rest is added to runoff from the Lower Kissimmee Basin and flows to the lake through the S-65E structure. In addition, Lake Istokpoga’s discharge passes through the Lake Istokpoga Water Management Basin and takes various paths to Lake Okeechobee. Please see Appendix 5-3, Table 2, for Lake Okeechobee monthly inflows structure by structure.

Comment: 38) p. 5-34, l. 498: *What two months are you referring to and what years?*

Response: “The two exceeding months were October, 1948 (hurricane year) and March, 1998 (El Nino year)”. This sentence is added.

Comment: 39) p. 5-34, ll. 511-512, *editorial suggestion (add word season): During the hurricane season and following months, the outflows from the Everglades Agricultural Area (EAA) were very high. Outflows through structures G-370 and G-372 into Stormwater...*

Response: Changes made as commented.

Comment: 40) p. 5-34, l. 517, *same editorial suggestion (add word “season”): S3-52, and S-354) during the hurricane season and following months are shown in Figure 5-21.*

Response: Changes made as commented.

Comment: 41) p. 5-50, ll. 712-713: *editorial suggestion (add word “annual”): Central and South Florida. Regional estimates of annual ET from open water and wetlands that do not dry out, range from 48 inches in the District’s northern section to 54 inches in the Everglades.*

Response: Changes made as commented.

Comment: 42) p. 5-34, l. 524: *What level did the stage reach (associated with 5.38 ft right between August and October?*

Response: The following sentence provides the answer “The 18.02 ft NGVD, maximum stage of lake Okeechobee on October 13, 2004 was within ...”

Comment: 43) p. 5-34, l. 528: *What was the magnitude of water rise in WCA1?*

Response: The rise in WCA 1 was 1.62 ft (Figure 5-29).

Comment: 44) p. 5-36 – 5-39, Figures 5-22 to 5-29: To put these plots into their historical perspective it may be helpful to plot the daily data with duration hydrographs of selected percentiles, such as the 10th, 25th, 50th, 75th and 90ths. It seems as though most of the sites have long enough period-of-record (>30 years) to compute the necessary statistics. Below is an example for Savannah River flows in 2002. By using the percentile flows, it is very easy to see that streamflows at the beginning of the year set records for minimum flows and during the summer flows were around the 95th percentile. At the end of the years, with the end of the drought, flows increased to the median range (50th-percentile).

For figures 5-22 to 5-29, the historical range of conditions for each day of the year would help put the data from the 2004 hurricane season in its historical perspective.

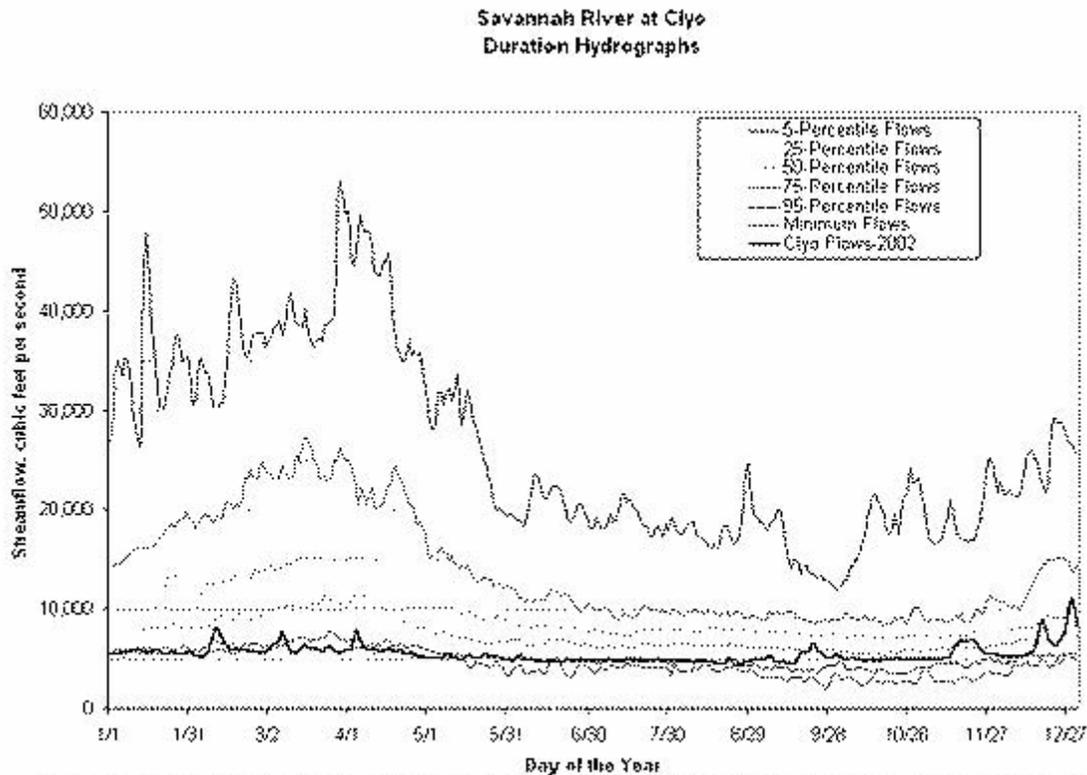


Figure 35. Graph showing duration hydrographs for Savannah River near Clyo and daily hydrograph for the calendar year 2002 streamflows. Percentile flows are based on streamflow data from 1929 to 2003.

Response: Will consider comment for future report.

Comment: 45) p. 5-50, l. 712: What is the time scale for the reported ET values?

Response: The time scale is annual; the sentence is edited and now includes “annual”.

Comment: 46) p. 5-50, l. 715, reminder (do not forget to include figs 5-31 through 5-45): depicted in Figures 5-31 through 5-45. The closest site to a rainfall area with available ETp data...

Response: Figures 5-31 to 5-45 are in the preceding pages showing both rainfall and ET.

Comment: 47) p. 5-50, Equation 1: The explanation provided for the variables in this equation do not equal mm d-1. Is something missing to cancel out the kg and the other m like water density?

Response: A kilogram of water is 0.001 cubic meter; 1 m = 1000 mm (m = meter; mm = millimeter)

$$ET \text{ (mm)} = (\text{MJ} / \text{m}^2 / \text{day} / \text{MJ} / 0.001 \text{ m}^3) * 1000 \text{ mm/m}$$

Comment: 48) p. 5-51 – 5-58, Figures 5-46 to 5-53: Suggest improve consistency between the gage name and the reference in the figures. For example, text references “site S-57 headwaters” and the figure references “site S57_H.” Using “headwater” in the caption allows the figure to stand on it own better.

Response: Site S57_H stands for site S57_headwater.

Comment: 49) p. 5-51, ll. 728-730, editorial suggestion (merge the two sentences): The maximum daily average water level was 64.17 ft NGVD (December 20, 1999) and the minimum was 58.13 ft NGVD; the minimum stage was reached during the 2000–2001 drought in South Florida. Daily water level observations for Lake Alligator in the last 12 years.

Response: Changes made as commented.

Comment: 50) p. 5-61, ll. 907-926: You litter the discussion with “attain” as if the water levels are goals.

Response: The word “attain” is removed and replaced with “reach”.

Comment: 51) p. 5-66, l. 1029: 3,501,889 (units need to be added).

Response: Changes made as commented.

Comment: 52) p. 5-66, l. 1031: What fraction of increased inflow to Lake Okeechobee was contributed from hurricane activity?

Response: It is difficult to assign a percentage, but over 75% of the inflow to the lake was between August 1, and December 31, 2004 (see Appendix 5-3, Table 2).

Comment: 53) p. 5-67, l. 1070: correct line formatting error.

Response: Changes made as commented.

Comment: 54) p. 5-71, l. 1122: Add an s to the word record.

Response: Changes made as commented.

Comment: 55) p. 5-74, l. 1178: Is the word “width” missing? canal breach into the L-3 extension canal. The breach has a bottom width of 150 ft, at an elevation of....

Response: Changes made as commented.

LITERATURE CITED

Ugarte, C. A., Brandt, L. A., Melvin, S. and Mazzotti, F. J. 2005. Hurricane Impacts to tree islands in Arthur R. Marshall Loxahatchee National Wildlife Refuge, Florida. *Southeastern Naturalist*, (submitted).

USFWS. 2005. Arthur R. Marshall National Wildlife Refuge Annual Narrative Report: Calendar Year 2004. U.S. Fish and Wildlife Service, Boynton Beach, FL.

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Topic: Comments from Ward (2 of 2), Read 11 times **NEW**

Conf: [Chapter 5: Hydrology of the South Florida Environment](#)

From: [Wossenu Abteu wabtew@sfwmd.gov](#)

Date: Friday, September 23, 2005 11:12 AM

Topic: Comments from Ward (1 of 1), Read 3 times

Conf: Chapter 5: Hydrology of the South Florida Environment

From: Jeff Jordan jjordan@griffin.uga.edu

Date: Monday, September 19, 2005 10:41 AM

RESPONSE

From: Wossenu Abteu wabtew@sfwmd.gov
September 23, 2005

Comment: Chapter 5 presents an excellent overview of South Florida's hydrology for WY 2005. The year's extreme hydrologic events challenged the authors of Chapter 5, but the description is well developed and documented.

Four hurricanes impacted South Florida in WY 2005 but the average rainfall was below average! The timing of the rainfall varied greatly over the year and District area.

Response: Although the water year rainfall was below average, the spatial and temporal distribution of the rainfall had impact on water management as much as the magnitude. Also pre- and post-hurricane hydrology becomes part of the resulting water management.

Comment: Is documentation for the SFWMD hydrometeorologic monitoring presented in the report by Crowell and Mtundu (2000). The title of the reference is noted as being QA/QC, not a full monitoring program design, thus the question. Is the hydrometeorologic monitoring design based on regulation schedules (line 1121-1123) that guide operation of the pump facilities? Has the hydrometeorologic monitoring design been peer reviewed? How does one access the design? Does the design describe the monitoring network (measuring where, when, and how)? Or are the multiple designs, Each project with its own hydrometeorologic network?

Response: The District-wide rainfall and weather stations network is a result of traditional monitoring network where the monitoring network design did not precede the monitoring network. A series of network reviews or evaluations have been done in the past and there are also studying currently in progress. The following reports are available in the District Reference Center or can be acquired from Dr. Chandra Pathak in Operations and Hydro Data Management Division at the District.

- Assessment of the Rain Gage Network in the South Florida Water management District. – September 1994
- Assessment of the Evaporation Pan Network in the South Florida Water Management District - 1995
- Testing the Adequacy of a Kriging Model of the SFWMD Rain Gage Network – July 1996
- Enhancement of Stage Monitoring Network for Greater Everglades Wetland Areas -2004
- Pilot Study for Flow And Stage Network Optimization Study – 2005
- Rain Gage Network Optimization Study for the South Florida Water Management District – on-going study and to be completed March/April 2006

There are project based network designs such as the Everglades Nutrient removal Project. Three peer-reviewed Journal publications related to network analysis and design are:

- a) Abtew, W., J. Obeysekera and G. Shih. 1993. "Spatial Analysis for Monthly Rainfall in South Florida". Water Resources Bulletin. Vol. 29(2):179-188.
- b) Abtew, W., J. Obeysekera and G. Shih. 1995. "Spatial Variation of Daily Rainfall and Network Design." Transactions of ASAE. Vol. 38(3):843-845.
- c) Ali, A., W. Abtew, S. Van Horn and N. Khanal. 2000. "Temporal and Spatial Characterization of Rainfall over Central and South Florida." Journal of the American Water Resources Association. Vol. 36(4):833-848.

Comment: Why are the outflows of Lake Okeechobee for WY 2004 and 2005 so much above average (2,832,700 ac-ft and 2,617,958 ac-ft, respectively, compared to the historical annual average of 1,445,558 ac-ft) when the rainfall for WY 2004 and WY 2005 is close to average? Is it due to the timing of the rainfall over the water year?

Response: Temporal and spatial rainfall distribution affects Lake Okeechobee's inflows and outflows. Rainfall on the Lake Okeechobee watershed affects lake stage more than farther downstream. Rainfall in Upper Kissimmee Rainfall Area was significantly above average during the last water years. Antecedent lake stage affects discharge rates. Regulation schedules and water management decisions affect discharge rates from the lake. Also, conveyance limitations affect lake discharge rate.

Comment: Did the ENP flows in WY 2005 satisfy the 'Rain-Driven Water Deliveries Plan'?

Response: Chapter 6 "Ecology of the Everglades Protection Area" could address this.

Comment:
Conclusions

The South Florida Water Management District manages water quantities, as well as related attributes such as water quality and ecosystem health. It appears that water quantity management (i.e. water supply and flood control) are the core operations of the District. Thus, Chapter 5 is a key description related to the core function of the District. Furthermore, a number of times during the discussion in 2C there are explanations of the extreme hydrologic events and the impacts they had on P concentrations. Unfortunately,

Chapter 5 is where the explanation of the hydrologic events is presented. In reviewing the two Chapters, it was necessary to read Chapter 5 first. In support of putting more logic into the sequencing of the Chapters, would it be possible to move the hydrology discussion before the water quality findings are presented?

Response: The Workshop agenda is changed and Chapter 5 will be presented ahead of Chapter 2 and the other chapters.

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Topic: Ping Hsieh (2 of 2), Read 9 times **NEW**

Conf: [Chapter 5: Hydrology of the South Florida Environment](#)

From: [Wossenu Abteu wabtew@sfwmd.gov](#)

Date: Friday, September 23, 2005 11:08 AM

Topic: Ping Hsieh (1 of 1), Read 1 times

Conf: Chapter 5: Hydrology of the South Florida Environment

From: Ping Hsieh yhsieh@famuedu

Date: Tuesday, September 20, 2005 02:46 PM

RESPONSE

From: Wossenu Abteu wabtew@sfwmd.gov
September 23, 2005

Comment:

This year's chapter is well written and containing a lot useful information available to various users. For example, Fig. 76 is a great summary for a large part of the chapter and would be very useful to many end users. One important information missing in the chapter that came to my mind was the mean residence time (MRT) of the surface waters. I imagine that MRT of various part of the EPA would be quite different. Significant variation in MRT of surface water could explain many phenomena observed in the EPA. Understand MRT of various parts of an area could also provide important clues for understanding flow anomalies and improved management practices. Determining MRT may be a difficult task though. Tracer study such as that conducted in the STA may be able to help solving the problem.

Response: Computing Mean Residence Time for various parts of the EPA is a useful and complex analysis which will be considered in next year's report.

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Topic: Response to Comments from Meganck (2 of 2), Read 27 times **NEW**

Conf: [Chapter 8: Implementation of the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area](#)

From: [Tracey Piccone](#) tpiccone@sfwmd.gov

Date: Monday, September 19, 2005 09:44 AM

Tracey Piccone Response to Comments from Meganck

1. Table 8-1 presents a summary of projects underway throughout South Florida as part of the Long-Term Plan. These projects were developed under the broad headings as presented in the table. Is it therefore logical that, as results are known, they will form part of the suite of BMPs that will be applied, where appropriate, throughout the entire project area as part of a long-term management strategy?

Answer:

Some Long-Term Plan projects may result in the implementation of additional BMPs, but not all projects in the Long-Term Plan are focused solely on BMPs. For example, some projects involve optimization of regional treatment facilities (i.e., STAs) and some projects involve restoration of impacted areas in the Everglades. The Long-Term Plan projects that are focused on BMPs are expected to result in localized BMPs, not necessarily system-wide BMPs. In other words, what works in one area of South Florida, may not work in another area when it comes to reducing phosphorus at the source.

2. Is there a strategy as to how the State of Florida, the District and the USACE will coordinate the application of the results of such a range of projects (noted in table 8-1) currently being implemented overtime to ensure that the overall goal for all discharges to the EPA, including TP inflows is maintained?

Answer:

Yes, the strategy is to maintain constant communication between all stakeholders including the public, through quarterly communications meetings, the posting of all Long-Term Plan related documents, deliverables, etc. on the District's website, and other coordination efforts including communications with the Everglades Technical Oversight Committee (TOC).

3. A reading of the post-2006 strategy seems to imply that criteria will be used to assess specific recovery actions (source controls). Does the experience of the District indicate that you can actually determine the effect of specific measures given the physical and biological variance in each site where a water quality problem appears?

Answer:

The proposed Long-Term Plan recovery actions are different from "source controls". The Long-Term Plan includes some source controls (BMP) projects, but it also includes projects that will involve implementation of restoration activities in the impacted areas in

the Everglades. Although there is uncertainty as to whether or not one can actually determine the effect of specific measures on recovery, the Long-Term Plan includes modeling and research activities that are intended to assist in the identification of recovery of the impacted areas in the Everglades.

4. What is meant by the statement in lines 95, 96 "...including final implementation of the hydropattern restoration activities directed by the EFA once water quality standards (including phosphorus criterion) are achieved"? It seems to imply that certain restoration activities will not be initiated until water quality standards are met. This does not seem logical given that additional actions should positively impact water quality. Can you please clarify this statement?

Answer:

Water quality improvements can still be occurring while discharges continue to be sent to areas of the Everglades that are already impacted, however, the intent is to avoid sending high phosphorus discharges to previously un-impacted areas of the Everglades. Once the water quality of discharges has been improved satisfactorily, then new discharge locations can be implemented (i.e., through the Post-2006 Hydropattern Restoration projects of the Long-Term Plan).

5. Several challenges to achieving long-term water quality as defined in the law were noted in the 2005 report including regulatory issues, uncertainty in terms of the long-term performance of new technologies, and unknowns related to the CERP. What can the District report in terms of progress to address these issues?

Answer:

Progress in addressing these issues has been made over the past several years as evidenced by the reduction in the number of items in the uncertainties section of this chapter (see previous 3-4 annual reports). Not all of the uncertainties being reported are within the control of the District, however, we are continuing to report on the last few remaining uncertainties to continue to make the public aware of the remaining uncertainties in achieving the long-term water quality goals.

6. How are the baseline data sets for the Basin-Specific Feasibility Studies, noted in lines 180-187, validated in relation to the goal of improving the level of confidence in the TP loads when so many variables can potentially influence water quality?

Answer:

When the Long-Term Plan was developed, it was clearly recognized that the Baseline Data Sets would need to be continually updated as new information became available. For that reason, one of the Long-Term Plan projects is named "Update Baseline Data Sets". The focus of this project is not necessarily to "validate" the Baseline Data Sets, but instead to revise the data sets periodically to ensure that the best available information is used in the effort to develop new projects, as well as to track the progress of the efforts that are already underway.

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Topic: Comments by Jordan (2 of 2), Read 8 times **NEW**

Conf: [Chapter 8: Implementation of the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area](#)

From: [Tracey Piccone](#) tpiccone@sfwmd.gov

Date: Tuesday, September 27, 2005 10:54 AM

Tracey Piccone's Response to Jeff Jordan's comments:

In response to the comment that the District could do more with regard to Source Controls and future SFERs should focus more on this effort:

The District is already implementing an extensive Source Controls program in the EAA and in the Urban Tributary Basins as is described in great detail in Chapter 3 of the SFER. This program includes regulatory, rulemaking, research, compliance monitoring, education, outreach, partnering, cooperative agreements, and grant funding components. Large portions of the Source Controls program were already underway before the development of the Long-Term Plan, therefore, when the Plan was developed, several Source Controls components were added to it augment the District's existing Source Controls Program. Note also that the District is already working closely with agriculture and other stakeholders, including local governments and industry representatives in these efforts.

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Topic: Comments from Dr. Armstrong (2 of 2), Read 7 times **NEW**

Conf: [Chapter 8: Implementation of the Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area](#)

From: [Tracey Piccone](#) tpiccone@sfwmd.gov

Date: Tuesday, September 27, 2005 12:20 PM

Tracey Piccone's response to comments from Dr. Armstrong:

Thank you for recognizing the complexity of the issues surrounding efforts to achieve the long-term water quality goals for the Everglades, and for recognizing the District's efforts toward that goal. We recognize the need to enhance the chapter with an elaboration of the management process, overall results to date, and progress in achieving the water quality goals. Because FY 2005 was only the second full year of implementation of the Long-Term Plan, we would propose that next year's chapter focus more on this enhanced reporting effort.

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Chapter 6: Responses to Peer Review and Public Comments

Fred Sklar

RESPONSES TO PEER REVIEW PANEL COMMENTS (JOANNA BURGER)

Comment: *“This is an extremely useful chapter, much improved over last year. There is still a need to relate the specific research to the goals of CERP - How are the data used in short and long-term goals? What operations depend on ecological data?”*

Response: This is an excellent suggestion and good questions. Now that the CERP Monitoring and Assessment Plan (MAP) is complete, it will be easier to show how specific research is related to short-term research, long-term monitoring, and RECOVER hypotheses. We will design a table and use the CERP Conceptual Model to illustrate how Everglades science is linked to SFWMD operations, regulations, permitting, environmental monitoring, Everglades Forever mandates, CERP, and management decisions.

Comment: *“Within each research section in the summary, it might help to give the reasons for the findings, For example, why (in one sentence) did wading birds decline? What parts of this research have been peer-reviewed, and what was the outcome?”*

Response: It has always been our goal to give reasons and conclusions. However, we walk a thin line sometimes by stating a SFER “finding” when our data has not had the time to go through QA/QC or a formal review process. Therefore, all our SFER findings that have not been published in a scientific journal are discussed internally as part of a seminar series and reviewed by Sr. Scientific staff before incorporation into the SFER.

The new elevation map is currently being reviewed by RECOVER, District and CORPS staff.

“In one sentence” -- Reduced prey availability, as a result of anthropogenic changes in hydrology, is considered the primary factor responsible for the decline in Everglades’ wading bird populations.

Comment: *“The timing of the apparent switch of nesting wading (White Ibis) from Alley North should be correlated with increases elsewhere to examine the question of movement - incorrect estimates of the number of nesting waders is a problem for understanding the effects of long-term status and trends.”*

Response: A good point and a difficult problem. Only the maximum nest number recorded during the breeding season is sent to the District and used in the Annual Wading Bird Report as the index of breeding effort for a given colony. Monthly surveys are performed, but lead to underestimates due to asynchronous nesting or overestimates due to nest-failure and subsequent re-nesting. As a consequence, we can not determine whether any of the 10,000 or so birds that

abandoned Alley North in mid-March were part of the 2000 that were observed initiating nests in mid-April in the Refuge.

To account for the error associated with the population estimates, typical monthly survey schedules are being compared with the nesting histories of individual nests (see Fredericks et al. 2004). Because the sources of variation have yet to be quantified, the data in the SFER is better suited to identify long-term general patterns and as an index of nesting effort rather than as an absolute population measure.

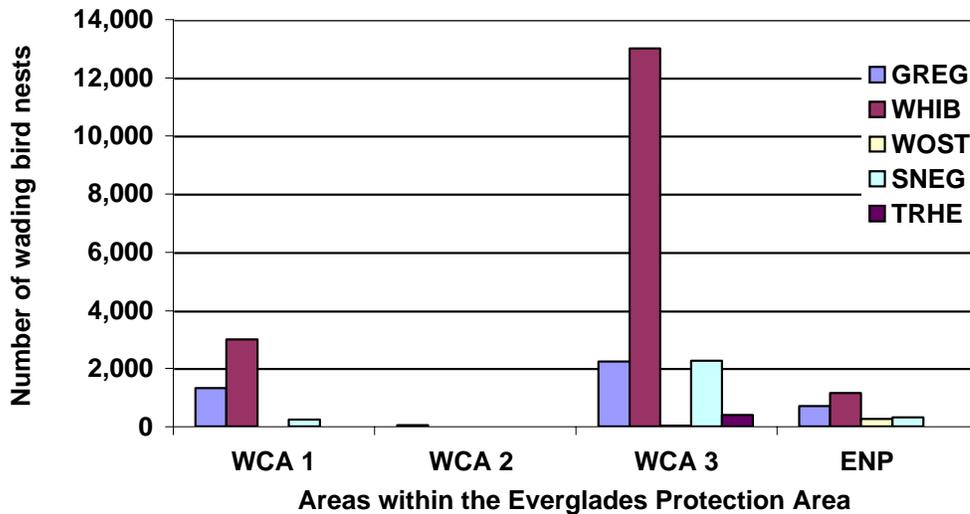
Comment: “Model the relationship between water levels, rainfall and wading bird nesting.”

Response: Yes! The Everglades Division is currently managing a large, multi-agency study that is modeling the relative contribution of short-and long-term effects of hydrologic stressors and landscape variables on the variation and trends in wading bird feeding patterns and population sizes based on 17 years of system-wide systematic reconnaissance flight data. Moreover, the Division is currently developing a number of experimental studies to examine the factors affecting wading bird foraging decisions.

Comment: “Add a graph to the wildlife section showing the number of wading birds by management region, especially for ENP.”

Response: See below:

Number of wading bird nests in the WCAs and ENP for 2005.



Comment: There was a general decrease in the number of waders nesting in the Everglades, partly because of poor foraging conditions in the water conservation areas. Although there is clearly a relationship between these factors, it should be more clearly examined.

Response: The relationship between rain-driven reversal events and Everglades wading bird breeding populations was not described in this report because it has been examined in great detail elsewhere within the context of prey availability. Reduced prey availability as a result of anthropogenic changes in hydrology is considered the primary factor responsible for the decline

in Everglades's wading bird populations (e.g., Kahl 1964, Kushlan 1986, Kushlan & Frohring 1986, Ogden, 1984, Gawlik 2002).

As water levels decline during the seasonal dry-down, aquatic prey are increasingly concentrated in isolated pools and become available to wading birds. A subsequent reversal in water level re-disperses prey, reduces their availability and limits the ability of wading birds to forage effectively. Local rain induced reversals probably negatively affected breeding birds in historical times, but birds probably also had the option of moving to alternative foraging areas which today are no longer available.

Comment: *“The study of macro-invertebrate use of soft and hardwater marshes is also an important potential factor in wading bird success and dispersion. However, the factors entering the PCAs are unclear, making it difficult to interpret the findings.”*

Response: We will revise the text with: PCA axis 1- accounted for 16% of the variance and no measured environmental variable was associated with this axis. PCA axis 2- accounted for 14% of the variance and measures of conductivity were positively associated with the axis (meaning that some species are associated more with hard or soft waters). PCA axis 3- accounted for 9% of the variance and was correlated with temperature (temperature was used as a surrogate for seasonality).

The confounding effects of nutrient status were minimized by restricting the analysis to sites with similar TP. Only sites in WCA-2A and the Refuge with TP < 10 ppb were selected. Thus, data are not indicative of eutrophication in the Everglades.

Comment: *The study of non-indigenous fish is an important one, and should be continued into the foreseeable future. What is the temporal relationship between indigenous/non-indigenous fish?”*

Response: Most invasive fish in south Florida are tropical in origin and limited in distribution by minimum temperature. To determine whether exotic fish are established in the EPA a necessary first step is to examine their distribution when temperatures are likely to be most limiting, i.e., during the winter months. We are currently developing a research plan to address the most important issues regarding non-indigenous fish invasions of the EPA.

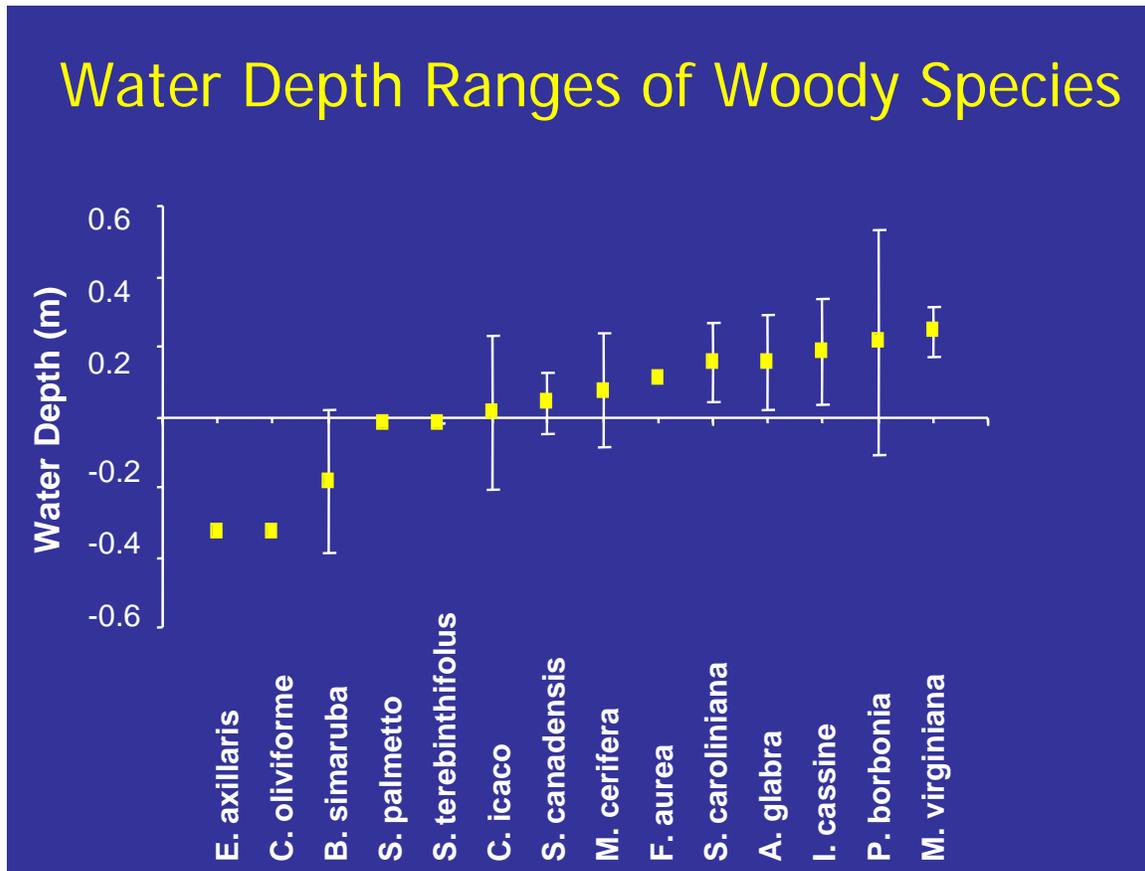
Comment: *Are there some non-indigenous species that are worse than others? less used by wading birds?*

Response: Potentially, however, there is not enough information to make any inference. There has been no research conducted on this topic, but we plan to develop research projects in this area.

Comment: *While the susceptibility of seedlings of tree island species to flooding is a critical series of studies, the overall objectives should be more clearly stated... The rationale for selection of species for study should also be included (perhaps in a table).*

Response: Good point. We study tree island seedlings in relation to hydrology for three reasons: (1) guide the rehabilitation of “lost” islands, (2) provide operational rules to prevent further tree island degradation, and (3) develop CERP tree island performance measures.

This unpublished data was the basis for the selection of species (see below):



Comment: 1. “The Rotenberger Wildlife Management Area has been the focus of study for some time, and is now experiencing an improved wet-dry season cycle that more closely resembles a natural hydrology. Continued monitoring of phosphorus into the system is important, as is continued monitoring of the spatial and temporal extent of fires. 2. Why were (NSM) targets not met?”

Response: 1. We agree with this statement. It is our recommendation that we cannot yet begin to assess the succession of wetland vegetative communities and that continued monitoring of the landscape vegetation changes should continue. Additionally, we recommend continued monitoring of the soil nutrients, possible every 3 years, to determine if the nutrients stored within the peat are being mobilized by the vegetation or fluxed into the overlying water column. 2. The G402 outflow gates have been operated so that they are opened when stage elevations reach 12.3 ft NGVD, which is less than the NSM maximum stage target of about 13 ft.

Comment: Can the tree island information be correlated with soil characteristics/nutrient patterns? Are there plans to model the elevation of tree islands?”

Response: Yes, we are just beginning to look at soil and nutrient patterns. We now know that: 1. root biomass is significantly higher on “nutrient poor” tree islands, 2. soil nutrients are extremely high on tree island heads, 3. litterfall production is highest on the head, and 4. trees grow better in short hydroperiod environments. Integration of this information will come after SETs are placed

on tree islands. Plans to model this will come after we have a more complete picture of how island elevation changes with time and across the landscape as a function of hydrology.

Comment: *How are the cost savings (associated with grid-based veg mapping) calculated?"*

Response: Cost savings are calculated by comparing the time it takes to map a fix unit of land surface using a vector verses grid system approach. Advantages of the grid system as opposed to a vector mapping approach for vegetation mapping include the unique ability to classify vegetation within the same quarter-hectare grid cells during future mapping efforts.

RESPONSES TO PEER REVIEW PANEL COMMENTS (JOANN BURKHOLDER)

Comment: *Pollution accompanying some of the hydrological changes should also be mentioned, as it is not only the changes in hydrology, alone, but also contaminants in some of the altered inflows, that are contributing to the overall problem."*

Response: We agree that pollutants are also of concern. The District has a pesticide monitoring program and the results of the evaluation of 62 pesticides and numerous other water quality parameters are discussed in Chapter 2A. Hg is addressed in Chapter 2B. In addition, Chapter 2B describes the effect of S, also a contaminant to the system. While S has a well-documented influence on Hg cycling, it can also influence P cycling by acting as an alternate electron acceptor.

Comment: *Wildlife Ecology -- Non-indigenous Fish: "good approach – but are similar data available for the warmer season, for comparison."*

Response: Prevailing theory states that invasive fish are limited by minimum temperature and this initial survey was conducted during a window of time allowing for parsimonious assessment of response in the field and cognizant of a precursor for establishment: the fish present must be adapted to the prevailing conditions. We are planning a spatially and temporally more extensive field study to determine habitat and seasonal variation in exotic fish distribution in conjunction with experimental tanks studies of minimum lethal temperature tolerance.

Comment: *WCA-3B Tree Islands: "Please describe the selection criteria (current island condition and potential for change in response to hydrological modifications) in more detail. Are two adjacent plots in each area (head, near tail) sufficient for statistical inferences?"*

Response: The selection criteria was simple. Tree islands were avoided if they had invasive species, such as Brazilian pepper or melaleuca, or if they had hunting camps. All tree islands in this study are expected to be influenced by the hydrologic modifications associated with CSOP and DECOMP, and will be used as a pre-construction baseline.

Rather than study few tree islands intensively, we choose to study many tree islands with two plots per area, as it will provide better information at the landscape level. Due to the small size of most tree island, two 10 x 10m plots will be sufficient for statistical inference.

Comment: *Characterization of soil nutrients in WCAs: "In addition to mapping the TN and TP, is similar information available for inorganic N forms? Although P appears to be more important in causing shifts in Everglades flora based on previous research, tracking the concentrations (and fluxes) of N in Everglades soils could be important for questions about eutrophication in "downstream" estuaries."*

Response: We did not examine the spatial extent of different N forms as part of this mapping effort due to cost and sampling complexity. However, we are following N cycling using porewater N, NH₄, NO_x measured along transects in the Refuge, WCA-2A, WCA-3A, and the ENP. We have found that much of the N is in organic form, with close ties between P and N turnover. We evaluated the potential turnover and microbial use of N through the use of enzyme activity, linking C, N, and P. These data are currently in manuscripts in review. We recognize that tracking N is key and therefore have recently initiated an N addition study that will allow us to track N through the food web.

RESPONSES TO PEER REVIEW PANEL COMMENTS (PING HSIEH)

Comment: *“How big were those tree seedlings? This experiment probably is more relevant to the germination rather than the survival of adult trees because the tolerance of drought or flooding of trees is related to the size and age of trees.”*

Response: Correct. This experiment was designed to evaluate the hydrologic requirements needed for the recruitment of new trees. The seedlings were about 1.0 ft tall.

Comment: *“Is there any study done to determine the life cycle of a tree island?”*

Response: No. However, cores indicate that fixed islands have been in place for 3,000 to 4,000 years. Understanding the successional biology of tree islands is a major goal of our research.

Comment: *“TP concentration may be higher in tree islands but the total amount accumulation may not be that significant because of the relatively small area of tree islands occupied in comparison to the marsh.”*

Response: Good point. We intend to explore this. However, tree islands can be dense in certain areas. And they may be able to store large quantities of nutrients in standing biomass. They may also have been spatially distributed to optimize nutrient removal.

Comment: *Plant Ecology - Downstream of STAs: “Why does the root TP concentration of sawgrass increase as the water TP decreases? How about the relationship between the total root TP content (i.e., TP concentration x root biomass) of sawgrass and the water TP concentration?”*

Response: We do not fully understand why the root TP concentration of sawgrass would increase as the overlying water column TP concentration decreases. We hypothesize the following:

1. During both pre and post-discharge periods the mean soil TP concentrations were elevated relative to natural areas, and the increased hydroperiod increased the growth rate of sawgrass in the post-discharge period, resulting in the mining of the P from the soil by the sawgrass.
2. While overall TP concentrations in the inflow water may be less during the post-discharge period relative to the pre-discharge period, the total volume of water, and; therefore, the total mass of P delivered to the area may be greater.

Comment: “Due to the possible big BD (bulk density) difference among different types of sediment in a wetland, it is better to express TP on an area basis (mg/m²) than in weight basis (mg/kg). Do you think Fig. 6-27 would be different, if it is expressed in an area basis? Does the pattern of TP coincide with that of the flow? (i.e., more flow more TP accumulated).”

Response: We agree that expressing TP on a volumetric basis is important to capture the differences in bulk density and we have done that. However, for the purpose of this report, to relate these data to the mandates; specifically the P rule that defines impacted areas as soil TP concentration > 500 mg/kg, we presented the data in mg/kg.

This spatial pattern of TP is strongly influenced by hydrology and soil type (peat versus marl). Specifically, overdrained areas of the Everglades have significantly higher bulk densities and subsequently have higher volumetric P concentrations. However, even with the BD correction the spatial extent of anthropogenically impacted areas are still apparent in the landscape.

Comment: “Fig. 6-33. It is interesting to notice that the pattern of elevation is similar to that of TP in Fig. 6-27. What does it mean?”

Response: Elevation looks like it is related to TP concentration but probably is not because TP concentration is a function of soil type, periphyton contribution, and the locations of water control structures that drain farmland.

Comment: “Fig. 6-29, What is the scale of Y-axis? Linear or ln? Also notice that TN is not responsive to TP increase beyond ln (TP) = 2.3.(200 ppm?) Does it mean that beyond ln (TP)=2.3, or, 200 ppm) P is no longer a limiting factor?”

Response: Interesting question, we have not conducted nutrient limiting studies using soils, but have typically looked at vegetation responses to conditions in the field. Here, we might be seeing differences in soil type. Marl soils tend to have TP values of ≤ 200 mg/kg, while peat soils tend to be more in the 300–500 mg/kg range. N:P and differences in N cycling of these different habitats likely drive these differences.

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

Comment: 1. Relate the objectives/outcomes of each research project to the long-term goals of CERP.

Response: Where applicable, this will be done in future reports.

Comment: 2. Add a diagram showing how each project is related to the other ecological projects, and to the recovery goals of CERP.

Response: A diagram will be added to future reports.

Comment: 3. Add a table showing how each project relates to SFWMD operations, regulations, permitting, environmental monitoring, Everglades Forever mandates, CERP.

Response: Where applicable, this will be done in future reports.

Comment: 4. Add a section near the beginning of the chapter that explains how data from each of the projects are being used in management decisions.

Response: Management decisions are based upon multiple factors, including all the science when applicable.

Comment: 5. Model the relationship between water levels, rainfall and wading bird nesting.

Response: A CERP contract is currently in place to address this task.

Comment: 6. Add a graph to the wildlife section showing the number of wading birds by management region, especially for ENP.

Response: This graph has been included in this appendix and will be included in future reports.

Comment: 7. Add a graph showing the relationship between abandonment and movement of ibis from one section of the Everglades to another.

Response: As stated earlier, this is a difficult problem and it is one that will require a significant amount of resources. We will discuss the feasibility of including such a graph into future reports.

Comment: 8. Add a table of the rationale for target levels of each species.

Response: Good point. This will be done in future reports.

Comment: 9. Continue experiments with crayfish to understand the threshold or lag-time between the movements of crayfish from the ridges to the sloughs.

Response: New crayfish experiments in LILA must be integrated into the long-term experimental strategy and hydrologic management of LILA. Therefore, we will continue these experiments, but you may not see results in the next SFER.

Comment: 10. Explore the causal relationship between macro-invertebrate dispersion and wading bird nesting/foraging areas.

Response: Good suggestion.

Comment: 11. Explore the causal relationship between indigenous and non-indigenous fish (i.e., are the non-indigenous fish filling different niches or taking over those of the indigenous fish).

Response: Excellent suggestion.

Comment: 12. Continue the development of an index of indigenous/non-indigenous fish as a useful bioindicator for the future.

Response: Excellent suggestion.

Comment: 13. Continue the tree seedling experiments.

Response: The LILA tree seedling studies will definitely continue.

Comment: 14. Add a section on burning of the specific parts of the Everglades that shows temporal and spatial trends (perhaps related to water levels).

Response: Future reports will outline the designs and results of two experiments to restore wetland functionality to impacted zones of WCA-2A. Both of these experiments use fire as an ecosystem driver.

Comment: 15. Model the physical and biological parameters that relate to tree island structure.

Response: All ecosystem and biological modeling has been relegated to the Office of Modeling at the SFWMD and we will notify this office of your comment. Note: A basic tree island model has been developed. See Wu Y. and F.H. Sklar. 2002. Evaluating Hydrologic Impacts on Tree Islands Using an Everglades Landscape Vegetation Model. pp. 469-498, Sklar and van der Valk. (eds.), Tree Islands of the Everglades. Kluwer Academic. Dordrecht.

Comment: 16. Develop a more extensive rationale and long-term research plan for the use of the benchmarks.

Response: This rationale and plan will be expressed in future reports.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: Use of the indices without reference to the elevation, and therefore hydrologic gradient, in the Refuge gives a somewhat misleading picture. Since the south is much wetter than the north, tree island flooding tolerances are exceeded well before the gauge data reach 17.5 feet in the south. The same is true for the lower tolerance; the north end is dry before the indicated 15+ feet.

Response: The spatial complexity of an individual conservation area is based upon where flows enter and leave. This report is not the place to discuss these spatial complexities. This report is only meant to give the FL Legislature an overview of the system.

Comment: How many sweep net samples were taken that were used in the calculations? How do you obtain density estimates using sweep nets? Are they swept within a known-area enclosure?

Response: The number of sweeps, their locations and the time of sampling will be added to the revision. Density is reported here as the number/sweep. Sweeps are done systematically at each site so the results among sites in comparable. The sweep method is a standard published protocol.

Comment: Wildlife Ecology: Temperature is not highly variable and generating correlations with highly variable data versus low variability data often does not work. It is also interesting to note that generally when we speak of correlation being useful for explaining something they are at the $r=0.6$ or greater level, here you present r values less than 0.4.

Response: Temperature here is used to distinguish samples collected in the winter from those collected in summer. The percent variance (< 31 percent total) explained by axis 3 (i.e., temperature), derived from matrix algebra of the total species by total sample matrix, may seem low but it is typical of ecological data and still contains ecologically relevant information. The correlation of axis 3 with temperature is an actual Pearson Product Moment Correlation Coefficient determined using the axis 3 sample scores (PCA) with the paired temperature value, which will be included in the revision of Chapter 6.

Comment: *Wildlife Ecology: Based on the low numbers of exotics caught in the WCAs, do you agree with Trexler et al's (2000) conclusion that they are not likely a major problem in the ridge and slough environment at this time?*

Response: As a co-author of the Trexler reference and this chapter, Robert Kobza concurs with the conclusion drawn by Trexler et al.; however, some of the methods are biased against invasive fish and some of the datasets used are now 10 years old. We believe that there is no vacant niche space in the Everglades aquatic community and that sampling of increased intensity and diversified method are required to measure the confounded ecological impacts of altered hydrology and invasive fishes. We believe the current fish community continues to be severely altered due to alterations in ecosystem structure and function.

Comment: *Ecosystem Ecology: Please present the rationale for selecting 33% cover as the dominate species.*

Response: We do not have a specific rationale for selecting 33 percent cover as the dominant species. However, this survey is less concern with rare species and more interested in dominant species. Professional judgment played a role in selecting 33 percent cover as the dominant species.

Comment: *Ecosystem Ecology: Is the y-axis 'milligrams/kilogram'? Some of the values seem very high in that case.*

Response: Yes, it is mg/kg and yes these values are very high. We have found average TP values as high as 80,000 mg/kg in WCA-3A, suggesting that tree islands are important nutrient sinks for TP and may function to maintain oligotrophy in the Everglades.

Comment: *There was no discussion in this chapter on the deviation to the water regulation schedule. The pattern of dry down was partially a result of the deviation which temporarily suspended the requirement to bring water into the Refuge before water supply releases. Is that addressed in a different chapter?*

Response: It should have been discussed as part of Chapter 5.

Comment: *Can you include a table of the new Class B benchmarks?*

Response: See below:

Station ID	Buffer Dist	X_SP83ft	Y_SP83ft
31	2	775037.844	524694.891
30	2	798139.296	528014.651
29	2	726160.521	528578.707
28	2	711917.144	529504.451
27	2	740199.119	530385.656
26	2	752514.183	530808.025
25	2	816016.891	533807.08
24	2	785290.512	539620.745
23	2	711917.144	544961.122
22	2	761639.206	546637.146
21	2	804288.143	548787.605
20	2	746131.561	549027.47
19	2	727932.49	551292.77
18	2	796297.786	557622.278
17	2.5	764730.712	563164.136
16	2.5	715939.775	565398.836
15	2	822912.44	570366.949
14	2.5	744990.867	571730.484
13	2.5	807616.936	578398.455
12	2.5	757706.467	587837.982
11	2.5	718174.474	588118.28
10	2.5	736202.288	598014.602
9	2	718852.1	604751.435
8	3	765409.491	615734.358
7	2	714260.062	617953.324
6	2.5	737661.348	622871.757
5	2.5	721333.043	633601.786
4	2.5	761454.021	645381.491
3	2.5	741043.64	648297.26
2	2.5	723549.027	650396.614
1	2.5	812776.749	681044.53

Table 1. Coordinates of the 31 Class "B" benchmarks.

Comment: *Why were the cattle egret (Bubulcus ibis) not included in the analysis?*

Response: Because they are not considered wetland foraging species.

Comment: *p. 6-7, ll. 162 –173: The changes in water levels at the WCAs were lowest at WCA1 and almost the same between 2 and 3, but you say WCA2 is the more dramatic, while WCA3 had no significant change. The length of time for the observed change was 4 months in both cases, so it is not clear what you all are basing the assessment on. Also, can you give an example when foraging times were historically good?*

Response: The use of the word “dramatic” has been removed. The sentence is trying to indicate the WCA-2A rose 1-2 ft in just two weeks, whereas, other regions rose 1-2 feet within 5-6 weeks. We prefer to use the SFER as an update of current work and not a forum for a discussion on historical information.

Comment: *You claim one site to be indicative of the marsh hydrology for WCA-3B, but you do not provide any rationale for such a fantastic assumption.*

Response: You are correct. One site is not a good representative of an area. For that reason the reader is free to select any of the four sites displayed in Figure 6-4 and make their own conclusions as to the hydrologic trends in WCA-3B.

Comment: *p. 6-10, l. 250: How much was this overestimation?*

Response: See third response to Joanna Burger.

Comment: *p. 6-12: What is the significance of the crayfish study findings in terms of water management and restoration?*

Response: “Prey availability has long been considered an important causal factor in structuring animal communities, and has significant implications for the conservation and management of threatened predator populations (Hutchinson, 1959; Hairston et al., 1960). It is considered the single most important factor limiting the distribution and nesting success of wading birds... In the hydrologically fluctuating Everglades, a key environmental process driving prey availability is the interaction between the seasonal decline in water level and small-scale variability in vegetation structure and density across the ridge and slough landscape.”

Comment: *p. 6-16: A potential problem with the analysis described on this page is the confounding effects of nutrient status. For example, shifts in species diversity patterns and richness are typical of nutrient-influenced aquatic ecosystems. More information needs to be presented to help the reader tease out the potential confounding effects of nutrient status, in order to discern patterns due to changes in water hardness. How do the differences in the macro-invertebrate assemblage between hardwater and softwater marshes compare with other freshwater aquatic systems? Some of the findings, such as higher concentrations of chironomids in higher conductivity marshes, seem consistent with studies on eutrophication. I am just wondering if the findings in general are agreement with previous results.*

Response: See responses to Joanna Burger.

Comment: *What are the implications for the nonindigenous fish studies? How might removal of canals help or hurt?*

Response: Good questions and beyond our understanding at the moment.

Comment: *p. 6-30, l. 708: You claim that it is impossible to isolate an area from surface water run-off, but presently there is a consideration for impounding the WCA1 with levees and completely cutting off canal and other surface water sources to the Refuge, ultimately making it a completely rain driven system.*

Response: Sentence has changed to: “However, complete isolation from surface water discharges is currently not in place, so it is important to understand to what extent the system can withstand alterations in surface water chemistry without degradation in structure and function.”

Comment: p. 6-30, l. 714: *It is a little confusing. You say tree island elevation is decreasing relative to water levels. But you said earlier that water levels dropped. So what is going on, the tree islands are not being submerged, so are you saying they are eroding because of the lower water levels? Just not clear, please elaborate?*

Response: Elevations may be decreasing for two reasons. One, historical water levels were so low that the tree island soils were oxidized. Now, when we return levels to “healthy” conditions the islands are submerged for long periods of time. Long periods of inundation, in turn, reduce productivity and the creation of new peat soils.

Comment: p. 6-39, l. 823: *The text beginning here reports the possibility of a nutrient front in Rotenberger. This observation confirms a concern we expressed in previous report reviews that conducting hydropattern restoration with nutrient-enriched water will result in ecosystem changes that are difficult, if not impossible, to reverse. Huge sums of money are being expended in other portions of the Everglades to halt and reverse the effects of decades of nutrient enrichment. These results reaffirm the need to consider delaying hydropattern restoration activities until clean water is available.*

Response: Thank you for your opinion.

Chapter 7A: Responses to Peer Review and Public Comments

Beth Williams

RESPONSES TO PEER REVIEW PANEL COMMENTS

In its final report, the Panel noted that the Comprehensive Everglades Restoration Plan (CERP) Annual Report Chapter 7A is presented in a logical manner and is well written. The Panel stated that the link between the CERP and RECOVER (Chapter 7B) programs should be clear to anyone taking the time to study these chapters. The Panel observed that CERP goals are clearly defined as preserving South Florida's ecosystem and providing for the water-related needs of the region – both related to improving the timing, quality, and distribution of water deliveries to the ecosystem. The Panel agreed that in order to accomplish the goals of CERP, the District must complete the land acquisition program while preparing Project Implementation Reports (PIRs), based on data collected from a host of restoration actions.

The Panel was encouraged that the Acceler8 program, which was launched in FY2005 in an attempt to catalyze existing restoration efforts, should render tangible benefits to the Everglades and surrounding communities much quicker than originally planned. The Panel also took note of the many efforts being undertaken and summarized in the chapter. The Panel noted as a very positive development the achieving of 70 percent of the restoration plan's goals by 2011.

The Panel noted that a number of technologies and parameters considered fundamental to both CERP and Acceler8 are clearly being refined. The Panel acknowledged the statement that it is neither practical nor possible to restore portions of the Everglades to its historical condition. As the Panel has been insisting for several years, restoration is an on-going process leading to measurable improvements in ecosystem functioning based on defined parameters. The Panel supported the efforts being undertaken by the District to improve restoration.

The organization of the CERP Annual Report into three sub-sections was noted by the Panel as logical. The tables for reporting sections A and B were also considered to be fundamental for monitoring implementation. The Panel opined that Section C was reported in sufficient detail for the general public to be able to follow a specific action based on the principles elaborated.

The Panel considered the section reporting the status of program-level activities to be excellent as it clarifies the status and interactions of many CERP programs. Additionally, the Panel noted the establishment of a Construction Institute as a positive development in terms of transparency in the management of such a wide variety of programs and projects.

The maps provided to locate the pilot projects were viewed by the Panel as excellent in that they allow the reader to gain a certain degree of understanding as to the complexity and interrelated nature of the overall restoration program.

The Panel appreciated the inclusion of the legal framework section of the chapter, which clarifies the relationship between a specific law and actions/projects/programs.

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

Comment: *The Panel recommends that Acceler8 may be an interesting theme for a cross-cutting issue as part of Chapter 1, given that restoration is an overriding goal of the work of the District. One important issue is whether the state-funded Acceler8 has affected the consensus that existed regarding Everglades restoration.*

Response: This is an excellent recommendation, as Chapter 1B provides a context for the SFER in terms of cross-cutting issues affecting the South Florida ecosystems. CERP is intended to build upon certain federal and state Everglades restoration projects that were assumed to be complete during the planning processes for CERP.

The full suite of benefits from the implementation of all of the CERP – including Acceler8 – projects depends on the successful completion of projects such as the federally authorized Kissimmee River Restoration Project, the Modified Water Deliveries to Everglades National Park, Modifications to the C-111 Project, the Critical Restoration Projects and the C-51/STA-1E Project, as well as the state of Florida’s Everglades Construction Project.

During the past five years, the USACE and the District, in partnership with other federal, state, and local agencies and tribal governments, have been working to complete these projects while moving forward with the planning and design for initial construction of the CERP and Acceler8 projects.

The State of Florida, through its Acceler8 initiative, has committed over \$1.5 billion in additional State funds above the \$200 million per year already planned for CERP. The goal of the Acceler8 initiative is to complete the implementation of certain projects, including projects described in the CERP, by 2010. Through close coordination with Federal agencies, the District will design and construct Acceler8 Projects that are consistent with all or parts of the recommended plan for the corresponding CERP components. Acceler8 Projects that are consistent with CERP recommended plans will be recommended to Congress for crediting authorization.

Over the next five-year period, subject to issuance of Section 404 permits by the Department of the Army, construction will be completed by the District through its Acceler8 efforts for all or portions of seven of the ten projects initially authorized in WRDA 2000. These projects will provide approximately 261,400 acre-feet of water storage; 4,000 acres of stormwater treatment area; restoration of freshwater wetlands, tidal wetlands and near-shore habitat; and restoration of the quantity, quality, timing and distribution of freshwater to the estuarine systems such as Manatee Bay and Barnes Sound, while providing public access and recreational opportunities

Additional projects in the CERP to be completed in the next five-year period as part of Acceler8 and other State initiatives are all or a portion of projects recommended in CERP but not yet authorized by Congress. These projects will provide: significant increases in water storage; restoration of the quantity, quality, timing and distribution of freshwater to Biscayne Bay and Biscayne National Park; restoration and enhancement of wetlands by reducing over-drainage while restoring natural and beneficial sheetflow; increased spatial extent of wetlands; improved water quality and volume of water delivered to coastal estuaries; and public access and recreational opportunities.

A strong federal-state partnership has been established for CERP implementation. The USACE, District and other non-Federal sponsors continue to provide information to and consult and coordinate with the South Florida Ecosystem Restoration Task Force, the Florida-based Working Group and stakeholder advisory bodies to the Task Force.

Comment: *The Panel feels that greater emphasis on public reaction to specific activities such as Acceler8 may be interesting to include in future reports. Statistically valid samples of the population of the District or the State can be accomplished without massive contracting services.*

Response: We will be pleased to include public reaction in next year's report. The Panel may be interested in the District's ongoing Acceler8 web survey of what makes America's Everglades an extraordinary area, and what should be built upon as we go forward (http://www.commentmgr.com/pcs/publiccomment_acceler8_general.asp). This survey is exploring the public's understanding of CERP and Acceler8, the relationship between the two, and of specific projects. The survey delves into how well the public understands that Acceler8 will generate a large economic demand for goods and services, and that financing and fast tracking projects now will avoid increases in land, construction, and materials costs.

Comment: *The Panel would welcome a brief text noting the positive effects of water conservation techniques to the overall water balance/management equation over time.*

Response: We would like to refer the Panel to the Annual Work Plan Report in the 2006 SFER (Volume II, Chapter 2). This report includes performance measures, previously reported in the District Water Management Plan Annual Report, one of which is the effectiveness (gross per capita) of Water Conservation by Water Supply Region.

Comment: *The Panel suggests that talk of "getting water right" may vastly overstate the abilities of CERP (particularly given federal funding problems). One area where this is a concern is in regards to ASRs. While used elsewhere, the scale proposed in CERP is untested. Another concern is the perceived shift to water supply issues and away from Everglades restoration that is apparent in the Chapter.*

Response: The plan for meeting the overall vision of Everglades restoration consists of implementing a series of carefully sequenced projects that contribute to "getting the water right." Central to "getting the water right" are the concepts of quality, quantity, timing, and distribution. By 2010, the completion of the CERP pre-cursor projects (e.g., Modified Water Deliveries to ENP, Modifications to the C-111 Project, the Critical Restoration Projects), Acceler8 projects and other CERP projects will result in significant improvements in the natural environment in immediate project areas:

- **Quantity.** Full implementation of major water storage projects such as the C-44 component of Indian River Lagoon – South, C-43 and Everglades Agricultural Area reservoirs will provide 50 percent of total surface water storage. This is the first step in capturing the water presently released to tide that can be utilized by the natural and human environments.
- **Quality.** Full implementation of projects such as C-51/STA-1E will provide large reductions in urban and agricultural runoff entering the Everglades, thereby improving Everglades water quality.
- **Timing and Distribution.** Full implementation of projects such as Modified Water Deliveries to ENP and Picayune Strand will be a major step to Everglades Restoration. The Picayune Strand project alone will result in the restoration of over

55,000 acres of wetland habitat, supporting over 15 threatened and endangered species.

CERP proposes the use of ASR technology on an unprecedented scale. The Plan includes three ASR Pilot Projects to address technical uncertainties related to implementation of large scale ASR. Congressional appropriations are anticipated in FY2006 for installation and operational testing of the ASR pilots.

These pilot projects will investigate options for surface water withdrawal, injection and pumping cycles; water treatment technology; and the effects of pumping cycles on the groundwater and ecosystem in the region. Operating these pilot projects will provide insight into expected operational costs, which will aid in comparing ASR technology with conventional (i.e., surface water reservoirs) and alternative (e.g., desalination) technology to meet environmental water supply needs.

In addition, a plan for an ASR Regional Study was developed by an inter-agency team working with an independent scientific review panel. This study has been initiated to collect regional hydrogeologic and water quality data, and to develop a regional groundwater model and other tools required to address regional scale uncertainties.

Comment: *As part of the CERP program, the Panel suggests that public surveys include questions regarding the valuation of non-market goods (i.e., environmental amenities, etc.)*

Response: We will be pleased to include public surveys in next year's CERP Annual Report. In the Acceler8 web survey mentioned previously, respondents' opinions are sought on the impact that Acceler8 will have on their community; whether the health of the Everglades has improved; and whether the District should, regardless of cost, do whatever it takes to restore the Everglades. Public opinion is also sought on the importance of Acceler8 priorities including remaining on schedule, providing environmental benefits and providing water supply for people and the environment.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: *p. 7A-1, line 18: Revise the sentence as follows: “The District is partnering with the U.S. Army Corps of Engineers (USACE) to implement CERP, which is planned to be implemented constructed and operated over more than three decades. The plan is focused largely on increasing water storage and improving the timing, quality, and distribution of water deliveries to the Everglades ecosystem.”*

Response: Added and clarified text as suggested.

Comment: *p. 7A-3, lines 93-95: The wording makes it sound like the purpose of the project is to provide water to the Arthur R. Marshall Loxahatchee National Wildlife Refuge. The primary purpose of the project is water quality. The water that will be provided will come in the wet season, and is a very small percent of the overall refuge water budget. Add to end of last sentence, “...lost to tide in the project planning’s future-without project scenario.”*

Response: Additional language added.

Chapter 7B: Responses to Peer Review and Public Comments

Agnes McLean, Kim Jacobs, April Huffman and Patti Sime

RESPONSES TO PEER REVIEW PANEL COMMENTS

Comment: *What is the role of the Project Design Team or the Design Coordination Team in RECOVER activities?*

Response: RECOVER is a standing agenda item on the Design Coordination team and our program managers sit as members of the team. The project teams have most of their interactions with RECOVER through the Evaluation Team, although the Assessment Team reviews project monitoring plans and the Planning Team assists with planning issues.

Comment: *Has there been any reaction from the general public to the adaptive management program?*

Response: As our Adaptive Management strategy is in review, no, not at this point. We do have a roll out strategy that we will begin to implement shortly for management and the public.

Comment: *In previous panel discussions, it has been acknowledged that the stated goals of maintaining natural systems often times conflict with the goal and legal rights of developers (water supply and flood protection for new or expanded communities east of the Everglades). How is this debate being managed at the state level and should the Consolidated Report make specific note of the status of this issue?*

Response: In early 2002, the President and Governor signed an “Assurance of Projects Benefits Agreement.” A guidance memorandum “Identifying Water Needed to Achieve the Benefits of the Plan” is in review by the SFWMD, USACE and DOI. Last year, the state legislature passed legislation changing the way the water management districts do water supply planning, with an emphasis on alternative water supplies and a closer connection to land use and water planning.

Comment: *I am not clear as to the need for the interim goals and targets, given the use of the adaptive management program (AMP). The AMP allows decision-makers to make changes as new information becomes available. Perhaps release of implementation funds is tied to meeting interim milestones. Can you explain?*

Response: Establishing interim goals and interim targets are required by the Programmatic Regulations to ensure as CERP implementation proceeds that we are meeting our restoration goals and targets for water supply related needs.

Comment: *In 2002 a report by the NAS noted that CERP process may negatively impact water quality in Florida Bay. Has the District addressed this issue in this year’s report?*

Response: This question is addressed in Chapter 12 of the SFER.

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

Comment: *In the list of newly implemented projects, it may be helpful to provide a brief paragraph on the overall aim of this package of projects (if an overall strategy exists, rather than just a bunch of unrelated projects). Or the projects could be organized by type, if possible.*

Response: An overall strategy does exist and text has been added to the chapter.

Comment: *Also, it would help if the projects were cross-referenced with issues raised in the rest of the SFER. For example, which projects (if any) are related to the TP source issue.*

Response: Next year we will be more integrative.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: *7B-2: A graphic and reference to the document would help in the discussion of the adaptive management strategy section.*

Response: A graphic was added. As the document is in review, no reference is yet available.

Comment: *7B-3, lines 79-81: This sentence needs to cite the actual RECOVER document and not just the summary blurb in last year's SFER. Citation: RECOVER (2004) Assessing the Response of the Everglades Ecosystem to Implementation of the Comprehensive Everglades Restoration Plan. Final Draft – Preliminary Guidance Document. c/o U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL and South Florida Water Management District, West Palm Beach, FL, available at:*

http://www.evergladesplan.org/pm/recover/recover_docs/aat/rec_prelim_guid_dec_2004.pdf.

Response: Citation added.

Comment: *7B-6: Fish sampling methods testing in forested wetlands is listed twice.*

Response: Redundancy was removed.

Comment: *7B-2: What is the difference between a study that is underway and one that is ongoing in table 7B-1?*

Response: There is no difference; language was standardized.

Comment: *7B-9: Completion of the high-resolution vegetation map for the Refuge (referred to as WCA-1 here), has been a critical data need; however, it has not been completed yet.*

Response: Corrected in the text.

Comment: *7B-10: Cross reference Greater Everglades Tree Island Characterization with Chapter 6 and make sure the information is consistent.*

Response: The text was edited for consistency with Chapter 6 and a cross-reference was added.

Comment: 7B-13: *How does the wading bird nesting colony location work match with what is presented in Chapter 6? If it is the same or linked explain how.*

Response: It does not at this point. The data being collected is not yet ready for analysis but will most likely be included in the Chapter 6 discussion next year.

Comment: 7B-21: *Add a parenthetical note after “MAP component level” to state, “(see below)” to make it easier for reader to understand. Also, why is there expanded text for only one of the three levels? While the system-wide level has not fully been worked through yet, we understand our approach about assessment of hypotheses at the module level.*

Response: Language was added to the text.

Chapter 8: Responses to Peer Review and Public Comments

Tracey Piccone

RESPONSES TO PEER REVIEW PANEL COMMENTS (NEAL ARMSTRONG)

Comment: *This chapter is a summary of the Long-Term Plan, how it is being implemented and how it is presented throughout the 2006 SFER. The chapter includes sections dealing with the Plan's overview, revisions to it, challenges to achieving long-term water quality goals, and conclusions. The importance of the Plan is clear because its purpose is to guide the achievement and maintenance of water quality standards in the EPA, including the new phosphorus criterion. The complexity of the area is a significant challenge for a Plan like this, but it incorporates the basic elements of water quality management and adaptive management that can make the Plan successful.*

The numerous and diverse regulatory requirements that have been implemented over the years present unique challenges to the regulators and well as those regulated. The 2006 SFER, like those before it, have addressed these requirements and how the District has responded to them. In doing so the District has brought together in the SFERs the various initiatives and projects underway, the results achieved so far, and the conclusions that can be reached and lessons learned to take to the next level of activities. There is, however, in this process a certain fragmentation in a report like this that is inherent because of the many regulatory requirements that must be responded to.

The Long-Range Plan is one that can integrate the regulatory requirements with the water quality management activities undertaken and planned and identify the scientific studies needed to underpin management actions. This chapter provides some information about those regulatory and management plans, but it could be enhanced considerably with an elaboration of the management process, the overall results to date, and progress in achieving the water quality goals.

Response: Thank you for recognizing the complexity of the issues surrounding efforts to achieve the long-term water quality goals for the Everglades, and for recognizing the District's efforts toward that goal. We recognize the need to enhance the chapter with an elaboration of the management process, overall results to date, and progress in achieving the water quality goals. Because FY 2005 was only the second full year of implementation of the Long-Term Plan, we would propose that next year's chapter focus more on this enhanced reporting effort.

RESPONSES TO PEER REVIEW PANEL COMMENTS (JEFFREY JORDAN)

Comment: *This is an important chapter, given all of the efforts that have gone into establishing the 10 ppb phosphorus criterion. The chapter describes the use of source controls in the EAA and STA's in the ECP and how they have so far exceeded expectations.*

Table 8-1 is a good summary reference for projects discussed throughout the SFER.

Achieving these goals have been helped tremendously by the use of an adaptive management approach. as seen in the 2004 request to the FDEP, such an approach keeps information current and allows flexibility in long-term planning. The requested \$36 million over four years seems appropriate to the task.

The biggest challenge facing long term planning is noted on page 12 - controlling TP loads at the source. This is an important and unsettled economic issue. This is particularly tough issue for agriculture in terms of source pollution. The District could do important and pioneering work on identifying and designing policies in conjunction with agriculture to get at these issues. This should be the focus and a sustained and substantial effort in future SFER's.

Response: In response to the comment that the District could do more with regard to Source Controls and future SFERs should focus more on this effort:

The District is already implementing an extensive Source Controls program in the EAA and in the Urban Tributary Basins as is described in great detail in Chapter 3 of the SFER. This program includes regulatory, rulemaking, research, compliance monitoring, education, outreach, partnering, cooperative agreements, and grant funding components.

Large portions of the Source Controls program were already underway before the development of the Long-Term Plan, therefore, when the Plan was developed; several Source Controls components were added to it augment the District's existing Source Controls Program. Note also that the District is already working closely with agriculture and other stakeholders, including local governments and industry representatives in these efforts.

PEER REVIEW PANEL COMMENTS (RICHARD MEGANCK)

Comment: *1. Table 8-1 presents a summary of projects underway throughout South Florida as part of the Long-Term Plan. These projects were developed under the broad headings as presented in the table. Is it therefore logical that, as results are known, they will form part of the suite of BMPs that will be applied, where appropriate, throughout the entire project area as part of a long-term management strategy?*

Response: Some Long-Term Plan projects may result in the implementation of additional BMPs, but not all projects in the Long-Term Plan are focused solely on BMPs. For example, some projects involve optimization of regional treatment facilities (i.e., STAs) and some projects involve restoration of impacted areas in the Everglades.

The Long-Term Plan projects that are focused on BMPs are expected to result in localized BMPs, not necessarily system-wide BMPs. In other words, what works in one area of South Florida, may not work in another area when it comes to reducing phosphorus at the source.

Comment: 2. Is there a strategy as to how the State of Florida, the District and the USACE will coordinate the application of the results of such a range of projects (noted in table 8-1) currently being implemented overtime to ensure that the overall goal for all discharges to the EPA, including TP inflows is maintained?

Response: Yes, the strategy is to maintain constant communication between all stakeholders including the public, through quarterly communications meetings, the posting of all Long-Term Plan related documents, deliverables, etc. on the District's website, and other coordination efforts including communications with the Everglades Technical Oversight Committee (TOC).

Comment: 3. A reading of the post-2006 strategy seems to imply that criteria will be used to assess specific recovery actions (source controls). Does the experience of the District indicate that you can actually determine the effect of specific measures given the physical and biological variance in each site where a water quality problem appears?

Response: The proposed Long-Term Plan recovery actions are different from "source controls". The Long-Term Plan includes some source controls (BMP) projects, but it also includes projects that will involve implementation of restoration activities in the impacted areas in the Everglades.

Although there is uncertainty as to whether or not one can actually determine the effect of specific measures on recovery, the Long-Term Plan includes modeling and research activities that are intended to assist in the identification of recovery of the impacted areas in the Everglades.

Comment: 4. What is meant by the statement in lines 95, 96? "...including final implementation of the hydropattern restoration activities directed by the EFA once water quality standards (including phosphorus criterion) are achieved"? It seems to imply that certain restoration activities will not be initiated until water quality standards are met. This does not seem logical given that additional actions should positively impact water quality. Can you please clarify this statement?

Response: Water quality improvements can still be occurring while discharges continue to be sent to areas of the Everglades that are already impacted, however, the intent is to avoid sending high phosphorus discharges to previously un-impacted areas of the Everglades. Once the water quality of discharges has been improved satisfactorily, then new discharge locations can be implemented (i.e., through the Post-2006 Hydropattern Restoration projects of the Long-Term Plan).

Comment: 5. Several challenges to achieving long-term water quality as defined in the law were noted in the 2005 report including regulatory issues, uncertainty in terms of the long-term performance of new technologies, and unknowns related to the CERP. What can the District report in terms of progress to address these issues?

Response: Progress in addressing these issues has been made over the past several years as evidenced by the reduction in the number of items in the uncertainties section of this chapter (see previous 3-4 annual reports). Not all of the uncertainties being reported are within the control of the District, however, we are continuing to report on the last few remaining uncertainties to continue to make the public aware of the remaining uncertainties in achieving the long-term water quality goals.

Comment: *How are the baseline data sets for the Basin-Specific Feasibility Studies, noted in lines 180-187, validated in relation to the goal of improving the level of confidence in the TP loads when so many variables can potentially influence water quality?*

Response: When the Long-Term Plan was developed, it was clearly recognized that the Baseline Data Sets would need to be continually updated as new information became available. For that reason, one of the Long-Term Plan projects is named “Update Baseline Data Sets”.

The focus of this project is not necessarily to “validate” the Baseline Data Sets, but instead to revise the data sets periodically to ensure that the best available information is used in the effort to develop new projects, as well as to track the progress of the efforts that are already underway.

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

Comment: *To Be Added.*

Response: To Be Added.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: *1) General: My overall impression of this Chapter is not very positive. It goes into very few specifics on how water quality goals for P will be met over the long term. I believe that achieving the 10 ppb criterion over the long term will be very difficult using the existing approach.*

Response: The Florida legislature, in the 2003 amended Everglades Forever Act, recognized the Long-Term Plan as the Best Available Phosphorus Reduction Technology (BAPRT) for the Everglades. In 2005, the Everglades phosphorus rule was formally approved by the USEPA. The rule states:

The Long-Term Plan constitutes a comprehensive program to optimize the STAs and BMPs to achieve further phosphorus reductions and thereby accomplish implementation of Best Available Phosphorus Reduction Technology (BAPRT).

It is the intent of the Commission that implementation of this rule will fulfill commitments made by the State of Florida to restore and maintain water quality in the EPA, while, at the same time, fulfill the States obligations under the Settlement Agreement to achieve the long-term phosphorus concentration levels and discharge limits established in that Agreement for the Loxahatchee National Wildlife Refuge (Refuge) and the Everglades National Park (Park).

Finally, the SFER authors were instructed to focus on new information in this year’s report, to avoid repetition of information that can be found in earlier reports, and to reference earlier reports and/or website locations where interested readers can access more in-depth background information for each chapter. Please refer to the previous years’ reports as well as the Web site and the Long-Term Plan document itself to obtain the specifics of how the water quality goals for P will be met over the long term.

Even worse, the only water quality issue mentioned in the chapter is P. In my view, one of the major problems with restoration efforts at improving water quality in the Everglades has been the single-minded focus on the P issue in isolation. In my opinion, this has distorted the whole approach to water quality improvement in the ecosystem, and continues to be an impediment to

progress. While P is certainly an important water quality issue in this ecosystem, it is certainly not the only water quality issue.

Furthermore, ignoring other water quality factors and treating the P issue in isolation actually also inhibits achieving the P criterion of 10 ppb. For example, sulfate contamination entering the ecosystem (apart from its impact of mercury) causes more rapid recycling of P and N from sediments (detrital organic matter) by stimulating anaerobic microbial sulfate reduction in sediments. Since most STAs are flooded with sulfate-contaminated water, permanent sequestration of P and N in the sediments is inhibited by the presence of the sulfate. An approach to water quality control in Everglades restoration that considers all pertinent factors will be essential to achieving real restoration over the long-term.

A discussion of other water quality parameters of concern occurred between members of the Peer Review Panel, Tracey Piccone (SFWMD) and Frank Nearhoof (FDEP) at the Peer Review Workshop on September 28, 2005. During this discussion, it was noted that in recent years, parameters of concern other than phosphorus have been relatively few. Chapter 2A of the Draft 2006 SFER presents a summary of parameters of concern in the EPA and indicates “With few exceptions, water quality has been in compliance with existing state water quality criteria during WY2005.”

The SFWMD and FDEP acknowledge that the focus of restoration efforts to date has been on phosphorus because it has been recognized to be the most significant parameter of concern for the Everglades. The agencies recognize that other water quality parameters of concern may require attention and will not be ignored.

Comment: *General: The October 2003 LTP described STA optimization measures to be implemented before December 2006. These were forecasted to produce discharge concentrations in the 10-15 ppb range. Given new information acquired since October 2003, what is the likelihood that the performance goal and timetable will be met? What factors would account for any deviations from the expected performance and timetable?*

Response: In spite of construction delays and damage to some of the STAs due to two hurricanes in 2004, the District continues to actively implement the STA optimization measures described in the Revised Part 2 of the Long-Term Plan, dated November 2004. Certainly, factors outside the control of the District such as major hurricanes can significantly impact the District’s ability to meet performance goals and timetables; however, the District remains committed to achieving those goals in spite of past and potential future obstacles.

Comment: *General: Chapter 4 describes STA maintenance and enhancement measures that have been undertaken and are underway in the existing STAs. These measures typically require temporary shut-down of STA cells and loss of treatment capacity. Overloading other STA cells during these periods impairs performance and risks long-term damage to vegetation. Does the LTP envision that maintenance/enhancement measures requiring shutdown will occur in the future? Does the plan provide sufficient excess treatment capacity so that performance is not compromised during maintenance/enhancement periods and that the integrity of vegetation in the operating STA cells is maintained?*

Response: In the Pre-2006 projects component of the Long-Term Plan, it was recommended that some treatment cells be retrofitted with entirely new interior levees and associated water control structures. This sort of construction activity is not “typical” STA maintenance. It is a major

undertaking lasting several months, unlike routine maintenance that could be addressed without shutting down or drying out a treatment cell.

To minimize impacts to the environment (avoid untreated bypass), to the contractor (construction in the “dry” is easier than in the “wet”) and the remainder of the STA (avoid overloading the other cells during construction), the Long-Term Plan recommended that the new levees and associated structures be constructed during the dry season. It should also be noted that even more involved maintenance work such as cleaning out or replacing individual culvert pipes can be performed without the need to shut down an entire treatment cell for weeks or months.

Comment: 4) General: What is the ultimate objective of the long-term plan? Line 76 describes a 'planning goal' of 10 ppb, expressed as a long-term geometric mean STA discharge concentration. Lines 52-54 mention compliance with water quality standards. Measuring compliance with water quality standards and LTP success at downstream marsh sites will not restore and protect marsh areas between the STA discharge points and the marsh monitoring sites. Compliance with the P Criterion at discharge points is required to restore/protect the entire downstream marsh.

Now that the P criterion has been officially adopted, the LTP should adopt a firm treatment objective expressed in terms of an STA discharge concentration consistent with meeting the P criterion throughout the marsh, not just at marsh sites located at arbitrary and unspecified distances downstream. Under the TMDL process, the USEPA routinely requires that plans to achieve water quality compliance explicitly include a "Margin of Safety" to account for uncertainty and provide assurance of success. This concept is applicable to any planning process that involves uncertainty. A margin of safety can be provided by making conservative assumptions regarding uncertain factors, as is consistent with standard engineering practice.

Response: Same general response as to item number 1. The USEPA has approved the Everglades phosphorus rule which already recognizes the existing Long-Term Plan as the Best Available Phosphorus Reduction Technology. This is not to say that the Plan won't continue to be revised and refined as more information becomes available from the Process Development and Engineering (PDE) component, and as new and/or improved projects are implemented through the Adaptive Implementation component of the Plan.

Comment: p. 8-5, l. 75, Line 75 mentions that there is a "possibility" that the pre-2006 measures will achieve the treatment goals. Will a margin of safety be factored into subsequent iterations of the plan in order to provide a high probability of success (vs. just a "possibility")? If so, how?

Response: The plan was developed in full recognition that additional measures might be required and that the adaptive management approach would provide the highest probability of success. Please refer to Part 5 and Part 6 of the Long-Term Plan for more information related to this component of the Plan.

Comment: p. 8-5: Authors state that the combined performance of the EAA source controls and STAs have exceeded expectations; but what were the expectations.

Response: The initial target for the STA outflow concentrations was 50 ppb. Several STAs have produced long-term outflow concentrations well below this target, and averaged together, the STA outflows have generally met or been below the target. Several STAs have already produced annual outflow concentrations approaching the 10 ppb long-term target.

With regard to EAA source controls, the target reduction for the EAA BMPs was 25%, and to date, they have far exceeded that target averaging about a 50% reduction. As stated in Chapter 3 of the 2006 Draft SFER, “Over the 10 years since the program’s initiation, the EAA’s annual percentage load reduction average is greater than 50 percent.”

Comment: *On the same page further down, the authors state that “ ... it is possible that these improvements and strategies will not, in and of themselves, provide adequate assurance of an ability to consistently meet that objective” [e.g., 10 ppb P criterion] “on a long-term basis.” So which is it? Are the controls going to achieve this or not?*

Response: See response to Item #5 above. The Plan was developed in full recognition that additional measures might be required, and lays out a process for implementing those measures if and when their need is confirmed.

Comment: *7) p. 8-6: The post 2006 Long-Term plan will involve using an “adaptive management approach”, with “continued investigations” to improve water quality improvement strategies. Sounds impressive but says nothing about what approaches need to be taken to achieve the 10 ppb phosphorus criterion.*

Response: The adaptive management approach has already benefited the Long-Term Plan program. Please refer to the “Revisions to the Long-Term Plan” sections of Chapter 8 of both the 2005 and 2006 SFER. Also, please refer to comments from several Peer Review panel members who have recognized the benefits and successes of the adaptive management approach that is incorporated into the Long-Term Plan.

Comment: *8) p. 8-8, lines 181-201. How do the revised flows & loads compare with the original estimates?*

Response: In general, the revised flows and loads are higher. These new flows and loads are currently being used to evaluate STA performance for alternative water quality improvement projects developed as part of the EAA Regional Feasibility Study.

Comment: *p. 8-9, l. 237: How are the long-term increasing trends in Lake Okeechobee P concentration being considered in the plan development? Is there any allowance for the possibility that lake P concentrations will continue to increase? Are the lake phosphorus concentrations being assumed in LTP development consistent with recent measured values? This is one example of where a conservative assumption seems appropriate, especially given the increased flow volumes predicted to result from implementation of CERP/ACELER8, as well as potential future changes in the lake regulation schedule.*

Response: Agree. The Long-Term Plan already includes a project aimed at addressing the concerns noted in your comment number 9, however increased efforts are planned for this particular project in the coming months and years to improve our understanding of the impacts of the long-term trends in Lake Okeechobee P concentrations on STA performance.

Chapter 9: Responses to Peer Review and Public Comments

Amy Ferriter¹, Daniel Thayer and Leroy Rogers

RESPONSES TO PEER REVIEW PANEL COMMENTS

REVIEW 1 (RICHARD MEGANCK)

Comment: 1) *It is not yet clear as to how the District or the Federal government prioritizes investments in research and/or control actions of exotic species. Apart from the initial preference for plant studies, the criteria for selecting specific plants or animals need to be clarified.*

Response: Agree – The criteria are not a cross-agency exercise and that is a problem. This chapter aims to provide a status of nonindigenous species in Southern Florida. The status of the prioritizations is that they are lacking and not well-coordinated. Each agency operates independently in most cases. Noxious Exotic Weed Task Team (NEWTT) did prioritize plant species and that information is available in the “Weeds Won’t Wait” document. Florida Invasive Animal Task Team (FIATT) has a charge to prioritize animals, but has not yet done so. However, FIATT is in the process of gathering information from federal, state, and local land managers to determine the extent of selected non-native animal species that were identified in the Goodyear report.

Comment: 2) *I noted last year that public education and support in the control of exotics will be essential, yet I found only a very brief mention of these types of activities in this chapter; that being a reference to the CERP and RECOVER processes which, of course have more formal consultative mechanisms. Can any comment be made on this point?*

Response: This chapter is not a plan for managing nonindigenous species in South Florida. It is a status report. While education and outreach is important to discuss, the authors felt that this was not the appropriate place to do so. For detailed information on education and outreach, we direct readers to Concept 3 (pg. 41) in the “Weeds Won’t Wait” document that outlines outreach needs. Outreach is a huge component of the restoration effort, and for consistency’s sake, every chapter in this report could have an outreach section, or perhaps a stand alone chapter in the report that details all of the restoration outreach efforts is warranted.

Comment: 3) *Are baseline data for priority exotic animals being gathered in a systematic manner? In reading the chapter it is apparent that investments are being made, but it was difficult to ascertain the programmatic logic of the numerous efforts underway, with the exception of the python.*

¹ Boise State University

Response: pp. 9-15, 588-606 states that: – “Agency-sponsored programs to track the distribution of certain target exotic plant species regionally are in place. However, the availability of spatial data for most other invasive taxa in natural areas is lacking or not readily available. The Florida Fish and Wildlife Conservation Commission (FWC) maintain a county-level database for reptiles, amphibians, birds and terrestrial mammals (<http://www.myfwc.com/critters/exotics/exotics.asp>). FWC biologists compiled these data from both published and unpublished sources. The U.S. Geological Survey (USGS) maintains an extensive database for nonindigenous aquatic species by watershed (Pam Fuller, personal communication). These resources are valuable and have been used extensively in this report, but it is difficult to glean information about population dynamics of these species without more detailed specific locations and/or historical spatial data.

Certain animal species distributions are tracked at a higher level of detail in South Florida, but not in a consistent cross-taxa manner, and not by any single agency. These exceptions include varying agency efforts to track detailed distributions of Burmese python (*Python molurus bivittatus*), lobate lac scale (*Paratachardina lobata lobata*), and Mexican bromeliad weevil (*Metamasius callizona*). While these single-species monitoring programs are successful in tracking a specific animal, there is not a coordinated database in the state that spans taxa. Difficulties in monitoring invasive animals may, in part, be “the nature of the beast.” Tracking mobile organisms is inherently more difficult than documenting the occurrences of rooted plants.”

In Florida, animal data is not gathered in a systematic manner across agencies. The authors included the only exceptions to this in the chapter.

As stated above, once FIATT has identified species of concern, a list of non-native animal species will be constructed for further review. This review will comprise suggesting research priorities of non-native animal populations, including their ecological impacts on Florida’s public conservation lands, identifying pathways into the state, and organizing federal, state, and local agencies to begin inventories on their respective lands.

Comment: 4) *I am still confused as to why 15 federal and state agencies have some degree of jurisdiction relating to the management of exotics. This seems like an unmanageable situation to say the least.*

Response: The reviewer is correct. It is an unmanageable situation at this time. Florida is by no means unique and this situation reflects what is found in other states and at the national level.

Comment: 5) *This chapter indicates that basic research in controlling exotic plants has been underway for sometime. Has funding increased or remained flat? The Long-Term plan includes sufficient support to address some of the more complex questions included in the management of animal exotics, interactions of plant and animal species with an evolving hydrologic regime, the relationship between initial control of exotics and long-term management needs and funding, continued expansion of urban areas and the intensity of agricultural management and invasive plants and animals, among many other issues. What has been the response from budget holders?*

Response: Agency responses vary. In general, more money has been allocated to biological controls and associated issues such as adequate quarantine facilities. FDEP has experienced an increase in budgets related to invasive plants. Presently, FDEP is spending \$1.3 million on research on invasive non-native plants with an emphasis on biocontrol for *Lygodium microphyllum* and developing new chemical controls for species like hydrilla.

Federal funding has been somewhat piecemeal and not well-coordinated, however the National Invasive Species Council is helping Florida to develop a cross-cut budget for the Federal agencies, and a status of this effort will be added to the report.

Comment: 6) *I have not yet received a clear response to the question of a possible increase in the research effort in the STAs, given the changing water regime in these areas and the fact that they discharge directly into the EPA. What priority has been assigned to this issue?*

Response: This chapter does not include the STAs in its scope, and the authors ask that this question be directed to “Chapter 4: Stormwater Treatment Area Performance, Compliance and Optimization.”

Comment: 7) *The SFERTF (line 146) refers to the need for control methods at entry, distribution, and landscape levels and makes note of the inadequate level of funding at this point. What is the District’s strategy to turn this situation of “we don’t yet know enough about the impacts but we don’t have sufficient funds to find out” around?*

Response: The subject 1996 report points to the need for effective early detection and rapid response and the need for improved control technologies once a species is introduced. In the decade since its publication, progress has been made in Florida to improve control technologies for plants, but little has been done for animals in natural systems. While the District can and should respond to these issues by including nonindigenous species in future and ongoing restoration studies and research, the District has virtually no authority to screen organisms at points of entry and can only hope to develop effective controls once a species has been introduced to the areas under District jurisdiction.

Comment: 8) *Is there a specific requirement that proposed restoration activities include an analysis of impacts on exotics?*

Response: At the present time, there is no requirement to include an analysis of nonindigenous species in Everglades’s restoration activities. As noted in this chapter however, staff is beginning to build invasive species into the process and incorporate it as an element of CERP. Via this chapter, the authors hope that the nonindigenous species issue is presented in a context that will lend itself to implementing this process.

Comment: 9) *Last year it was noted that exotic species are spread during hurricanes and flooding (as well as by fires). The issue of funding research was raised. Is there currently any research being conducted on these issues? Are there measures that can be taken after such an event to minimize long-term impacts and reduce loosing ground each time a flood or other disaster occurs?*

Response: The chapter summarized available relevant work related to this issue. The general thinking is that these events are unpredictable and given the many variables involved (species, timing, type of disturbance, etc.), that the best strategy for dealing with “heavy duty” unexpected disturbance is to monitor the site post-event and act quickly if problems are detected.

REVIEW 2 (PING HSIEH)

Comment: *This year's chapter marks a major improvement over last year's report in that more relevant and specific information about the monitoring, assessment, status and management of non-indigenous invasive species in south Florida is provided. This is especially true in the second half of the report. However, the first part of the chapter that describes the various task forces, committees and programs that are involved for the invasive species control in South Florida is not as well-written.*

It is difficult for a reader to get an idea about why so many programs were established (e.g., SCG, NETT, FIATT, SFERTF, NEWTT, SFERWG, CRSFFRPEIS, ISWG, USACE and ANSTF, just to name a few), by various agencies, to do the job of invasive species control. Is there a lead program that is responsible for coordinating the effort of invasive species management in South Florida? If there is, which one is it? And how does it perform? What are the working relationships among all the programs? Is there any overlapping and redundant effort? Moreover, which of them are only advisory in functionality and which of them have the actual executive power and budget to carry out the management job? What programs are directly funded by SFWMD? What is the role of SFWMD in the invasive species management?

I got the impression that quite a bit of attention and funding has been put to this endeavor, but the results are still unsatisfactory. I know those questions may be difficult to answer but they need to be addressed, at least to a certain extent, to make this chapter comprehensive and more like an annual report rather than just a literary review. Is there any way that the structural and working relationships among those programs can be depicted in an administrative diagram? That will help convey the message of this chapter in an easy to read manner.

Response: These agencies are not administratively related to one another related to nonindigenous species, and the authors fear that such a diagram would be inherently flawed. An organizational chart is based on relationships between agencies. Unfortunately, there are no formal relationships between the subject agencies except for informal and voluntary cooperative partnerships to manage nonindigenous species.

The authors are willing to provide a table of associated regional funding, but question the inclusion of this information in this report given the fact that other chapters do not detail this type of data by "topic" (exceptions include project costs in the CERP Annual Report and the Lake Okeechobee chapter).

The authors fear that presenting nonindigenous species spending apart from spending on other essential restoration programs such as hydrology, water quality, and ecology gives the impression that a large amount of State resources are dedicated to this issue. The fact of the matter is that agency spending on nonindigenous species represents a small percentage of money that is spent on restoration regionally. The authors suggest that if this information is to be included in Chapter 9, that associated chapters should also report spending on research, monitoring and assessment efforts that are conducted outside of CERP.

Comment: *I also noticed that none of the authors are directly affiliated with SFWMD. Is this report representative to the viewpoint of SFWMD?*

Response: Authors Dan Thayer, Mike Bodle and Lou Toth are District employees. This report is representative of the view points shared by agencies that have been collaborating and cooperating on this issue for many years. While these cooperative efforts are entirely voluntary and supported by technical staff, the roles these individuals play has sustained the development of many landscape scale restoration programs related to invasive plants. Because of the close cooperation and leadership shown by the District in this collective effort, this report is by all accounts representative of the District's perspective.

Following are some specific questions:

Comment: L63: *Why is a patchwork habitat easily invaded by nonindigenous species?*

Response: Here, the term "patchwork habitat" is synonymous with habitat fragmentation. The authors are indicating that Florida's natural habitats are heavily fragmented by roads, canals and development. The fact that disturbed habitats are more prone to nonindigenous plant species is well-documented in the literature. Basically, by fragmenting a habitat, native species that would ordinarily thrive in interior spaces of a large habitat struggle to survive and become susceptible to invasion. The edge effect that results from fragmentation provides optimum habitat for opportunistic nonindigenous species. In addition, where species invade nearby disturbed habitat, the propagule pressure on adjacent natural areas is increased substantially.

Comment: L101-106: *Can't SFWMD take up the leadership?*

Response: The reviewer is referring to the following statement in the chapter: "At least 15 federal and state agencies have jurisdiction in Florida over the importation and movement of nonindigenous species, introductions of new species, prevention, and eradication, management of non-native species, and biological control research and implementation. Historically, policies held by these agencies often conflicted and there was no clear level of statewide leadership and mechanisms needed for coordination of management activities (Statewide Invasive Species Management Plan for Florida, 2003)."

The authors provide this information here to report the current situation in the State of Florida. The District has no authority to take a leadership role. While the District participates at the Committee level, work to coordinate state agencies is beyond the District's jurisdiction. Further, the concept of regulating species importation lies with the Federal government.

The District is working with the COE to take the lead in developing a Master Plan for invasive species in the Everglades, but this plan will be specific to the Everglades.

Comment: L126: *Please list the web site.*

Response: <http://www.ecostems.org>.

Comment: L142-145: *Is this program being established? Which one? How does it work?*

Response: This interagency coordination is ongoing and incorporated into the NEWTT/FIATT.

Comment: L150-153: *How much money is needed? What is the current funding level?*

Response: About \$92 million currently and in 2002 agencies reported underfunded projects at just under \$90 million.

Comment: L160-162: *Isn't the information provided in this chapter meaningful?*

Response: The authors hope that this chapter does provide increased meaningful information in the context of Everglades issues.

Comment: L183-184: *Need to mention that FIATT was established in 1993. The paragraph of (L328-335) needs to be moved here.*

Response: Acknowledged.

Comment: L206-210: *What has happened to the plan?*

Response: The ISWG is in the process of implementing 22 action items in the state strategic plan to foster better communication between state agencies, to track invasive species expenditures, to increase statewide public education and awareness about biological invasions, and to rapidly assess new potential threats to Florida's agricultural and environmental communities.

Comment: L225: *Is \$7 million an appropriate number?*

Response: Yes, it is correct.

Comment: L323-327: *That was in 1998, how about the SFERTF today?*

Response: NEWTT and FIATT are the key organizations carrying out SFERTF goals.

Comment: L384: *What has caused coyotes to move to Florida? Is the coyote a problem species in Florida?*

Response: The authors contend that the coyote falls into a gray area in that establishment of coyotes in Florida is the result of a natural range expansion throughout North America. Consequently, Florida's coyote population does not represent an introduced or technically nonindigenous species. It is a range expansion of an adaptable species facilitated by humans eliminating wolves and opening the landscape to agriculture.

With that said, there is a debate regarding this issue. It is true that there have been some documented cases of coyotes being released in Florida in the 1930s and 40s by hunters, but these animals were released in small numbers and then pursued with hounds. There may have been some undocumented releases too, but there is no evidence that any resultant breeding populations ever established.

Comment: L396: *Isn't the insect imported for biological control nonindigenous? Could it become invasive later on?*

Response: The primary consideration in selecting biological control agents is host-specificity. Host-specificity means that agents will only feed and complete their development on the target plant. Only agents that are believed to have a narrow host range are imported into the U.S. for study, and then they undergo intensive screening in an approved biological control quarantine facility to determine the host range of the herbivore.

In quarantine, a long list of test plants, including species that are related to the target, endangered or threatened species and economically important plants are exposed to the candidate biological control agents in no-choice feeding conditions, meaning that the proposed agents either feed on the test plant or die of starvation. Additional testing is conducted to make sure that adult females of the agents will only lay their eggs on the target plant. The historical record (>100 years) clearly shows that this methodology works, as there have been no examples of weed biological control agents attacking plants in the field that were determined to be unsuitable hosts during quarantine testing.

Comment: *All the figures presented after p.9-16 have no figure No. and legend. They all need figure No. and legend.*

Response: Acknowledged, the authors have added captions and legends to all of the figures, but this late revision did not make it to the WebBoard in time for this review.

REVIEW 3 (JOANNA BURKHOLDER)

Comment: *This chapter contributes an impressive, comprehensive evaluation of terrestrial, wetland, and aquatic nonindigenous species throughout eight ecological regions (“conceptual ecological models or CEMs” identified by RECOVER), including the Florida Keys, Florida Bay and the Southern Estuaries, the Greater Everglades, Western Big Cypress, Lake Okeechobee, the Northern Estuaries East, the Northern Estuaries West (= the Caloosahatchee Estuary), and the Kissimmee River Basin.*

Almost equally impressive, the authors present a comprehensive inventory of the labyrinth of the many, many agencies, plans, control programs, interactions, and limitations/flaws/concrete vs. vague responsibilities of sometimes-conflicting management efforts to control nonindigenous species. Having researched this topic previously, I realize that the situation seems jumbled because it just plain is – there often and historically has been little effective coordination (despite numerous attempts) among the many agencies and other entities involved. Apparently, there is no one lead program/ entity responsible for coordinating the overall attempts to manage nonindigenous species in South Florida – a typical problem in some environmental issues. The authors document the major need for improved coordination.

Among its major contributions, the writing represents the first complete listing with species annotations for those species either known or believed to be a serious threat to Everglades restoration efforts. The authors politely and effectively call for improved coordination among agencies/entities (beyond the tracking of NEWTT’s ECOSTEMS), and a coordinated state database that spans taxa. While noting that the potential impacts of invasive species has only recently become a high priority for CERP planning, nevertheless, many efforts of the District and partner agencies to inventory and control invasive species are described.

One clarification that would be useful to add would be to list (table format) the programs with direct District involvement, and associated District funding. I am also uncertain as to whether the chapter format, which is on the order of a major review of the entire issue rather than an annual report, was followed because of CERP’s only recently having prioritized potential impacts in its planning? The only other suggestion that comes to mind is that perhaps the authors could add a figure that depicts the relationships/parallel efforts of the various agencies/entities involved in this issue in South Florida.

Although the contents of the writing are very disturbing, this chapter was extremely interesting. The authors provided a brief national perspective on damages caused by bioinvasive species, and a summary perspective on Florida's vulnerability to bioinvasive species. They explained, as well, the history of various agencies in the nonindigenous species issue, the stepped-up introductions and routes within the past decade, and the historic lack of adequate funding to address the problem. Also included was extensive discussion of "management tools" or mechanisms/techniques that have been used in attempts to control bioinvasive plants and animals.

Comment: *ll. 137-162: These two paragraphs contain some repetitive information – please cull.*

Response: Acknowledged.

Comment: *l. 161: Change effect to effects.*

Response: Acknowledged.

Comment: *ll. 169-170: "restoration of lower salinity levels" – please describe in more detail, or omit – does "lower salinity" refer to marine salinities (~30-35 ppt), which were the historic norm when *Thalassia testudinum* was the dominant seagrass? If it refers to brackish conditions, then the authors need to document that the historic norm was brackish rather than marine.*

Response: The authors are indicating that restoration efforts that result in increased freshwater in Florida Bay may result in an increase in suitable habitat for nonindigenous fish such as the Mayan cichlid, although this unintended consequence has not been thoroughly studied.

Comment: *ll. 206-210: What does/will this plan effectively accomplish?*

Response: The ISWG is in the process of implementing 22 action items in the state strategic plan to foster better communications between state agencies, to track invasive species expenditures, to increase statewide public education awareness about biological invasions, and to rapidly assess new potential threats to Florida's agricultural and environmental communities.

Comment: *ll. 272-273: Secretaries, Agriculture, Commerce, and the Interior should be capitalized.*

Response: Acknowledged.

Comment: *ll. 355-356: Are any efforts being undertaken to strengthen documentation of marine impacts? Would be helpful, if so, to mention them here.*

Response: Acknowledged.

Comment: *ll. 670-672: Excellent point about the limitations of remote sensing technologies.*

Response: Acknowledged.

Comment: *ll. 772-775: Should be moved to the first introductory paragraph of this chapter – great, and sobering, information.*

Response: Acknowledged.

Comment: *ll. 818-820: Excellent cautionary point.*

Response: Acknowledged.

Comment: ll. 827-829: The “win, lose, or draw” system (lines 850-852) should be described a little more here – a nice, innovative approach.

Response: Acknowledged.

Comment: Use of personal communication – please also include the institution of affiliation (e.g., lines 892-893, 966, 1186, 1273, 1957, 2184).

Response: Acknowledged.

Comment: l. 1090: Should read: ...Estuaries are poorly

Response: Acknowledged.

Comment: l. 1182: Should read: ...early 1990s, Lygodinium occurred....

Response: Acknowledged.

Comment: P. 9-38: Please reverse the order of the two figures (1993 on left, 2003 on right).

Response: Acknowledged.

Comment: ll. 1213-1214: Briefly, what has the effect of the biocontrol agent mentioned? (also, please include the species used).

Response: Acknowledged.

Comment: ll. 1278-1281 vs. ll. 1218-1284: Was a sentence omitted between these two sentences? Seems to be a “jump” in the writing.

Response: Acknowledged.

Comment: l. 1296: Please briefly describe the “certain characteristics that concern scientists.

Response: Acknowledged.

Comment: l. 1420: Should read: ...game of “cat and mouse” causes....

Response: Acknowledged.

Comment: l. 1486: What biological agent did the USDA release? Please describe the effects so far?

Response: Acknowledged.

Comment: ll. 1540-1545: Excellent and ironic points.

Response: Acknowledged.

Comment: ll. 1655-1656: Use of the native mangrove tree crab as an indicator species for measuring the increase or loss of functionality of the mangrove system was not mentioned in the Coastal Ecosystems chapter (chapter 12) – should be added.

Response: Acknowledged.

Comment: l. 1703: Should read: ...to manage. Intensive mechanical...

Response: Acknowledged.

Comment: l. 1949: Should read: ...killing it, the macroalga is reducing [alga is singular; algae is plural].

Response: Acknowledged.

Comment: ll. 1754, 1755, 1768: Please replace macroalgae with macroalgal.

Response: Acknowledged.

Comment: ll. 1786, 1974: Please clarify here the species of fish and marine invertebrate to help readers.

Response: Acknowledged.

Comment: l. 1812: Should read: ...hosts symbiotic photosynthetic algae, zooxanthellae...

Response: Acknowledged.

Comment: ll. 1822-1824: Sentence beginning “Spotted jellyfish...” – please further clarify. Does this refer to one spotted jellyfish? Of what size?

Response: Acknowledged.

Comment: l. 2125: Replace semicolon with comma.

Response: Acknowledged.

Comment: l. 2129: Doves should be plural.

Response: Acknowledged.

Comment: ll. 2245-2260: Nice, insightful analysis.

Response: Acknowledged.

Comment: Table 9-17: I could not find where this table was referred to in the text? Also, please describe this interesting study in more detail: How many trees were included? How many species? How was the study designed?

Response: The authors will incorporate more of the study specifics in the final chapter.

REVIEW 4 (DISTRICT)

Comment: 1. To avoid misunderstanding and unnecessary questioning of financial priorities pertaining to management of exotics by the general public, the District should take a pro-active stance in educating the public.

Response: Through the Invasive Species Working Group and other interagency efforts, the District is actively involved in a variety of outreach and education programs. We feel our present level of support through these efforts is sufficient, but we plan continued participation in new initiatives as they develop.

Comment: 2. A more detailed statement should be added as to the activities undertaken in WY2003 (and up to the cut-off point for new data in WY2004 for inclusion in the 2005 SFER) to control all the species noted in the chapter * either on a species basis or in general as to the progress made in realizing the overall goals of exotic plant and animal control.

Response: The authors will add a table of District-funded plant activities. Doing a cross-cut, all-agency, all-taxa, table will be more complicated and is not possible at this point.

Comment: 3. The Panel recommends that future versions of this chapter clearly indicate the protocols utilized in controlling both plants and animals and the relative success of these undertakings.

Response: Plants are fairly well spelled out and the scorecard format used this year tried to get this answered. Protocols for controlling animals are a few years off and will depend on FIATT for development.

Comment: 4. The Panel recommends that the District convene a meeting with principal agencies involved in the management of exotics and consider the possibility of recommending that a lead/coordinating agency be appointed.

Response: District staff supports exploration of a possible lead agency appointment, but do not feel that it is the District's role to spearhead that effort.

Comment: 5. The Panel recommends that species information from the STAs be included in this chapter in the future. However, the Panel is not certain as to how this would best be accomplished (STA team member or Exotics team member).

Response: The authors feel that the summary of the STA vegetation management program belongs in the STA chapter. Vegetation in the STAs is managed under a completely different set of objectives which do not fit well within the context of nonindigenous species control and restoration activities discussed in this chapter.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: 1) General: This chapter was extremely well written and appears to cover all the issues. Only thing I found was a few typos. I especially enjoyed having one or two problematic species highlighted following each module chapter - it flowed pretty well.

Response: Acknowledged.

Comment: 2) *General: Good to see animals included.*

Response: Acknowledged.

Comment: 3) *General: Chapter 6 of the 2006 SFER has a nonindigenous fish section. It might be appropriate to include this section in Chapter 9 which addresses nonindigenous species.*

Response: Acknowledged.

Comment: 4) p. 9-2, line 50: *Pimentel et al., 2000 has a dollar figure of \$138 billion for expenditures related to environmental damages from invading, non-indigenous species.*

Response: Acknowledged.

Comment: 5) p. 9-3, line 76: *Would read better if non-endemic pest was plural. To read “nonendemic pests.”*

Response: Acknowledged.

Comment: 6) p. 9-4, lines 122 thru 128: *Paragraph starting with “In 1998” and ending with “Everglades restoration” (line 128), is misplaced. Chronology of paragraphs on top half of this page jumps from 1993 to 1998 and then back to 1994.*

Response: Acknowledged.

Comment: 7) p. 9-4, lines 129 thru 136: *should be after “the spread of invasive exotic plants and animals” (line 122).*

Response: Acknowledged.

Comment: 8) p. 9-5, line 174: *FGFWFC 1999 is not the correct reference for the Fish and Wildlife Service Fish and Wildlife Coordination Act Report. Also, on line 173, it would be more appropriate to mention the Coordination Act report as a U.S. Fish and Wildlife Service product not as a U.S. DOI report.*

Response: Acknowledged.

Comment: 9) p. 9-5, line 208: *Capitalize “Governor of the State of Florida.”*

Response: Acknowledged.

Comment: 10) p. 9-7, lines 272-273: *Capitalize “Secretaries of Agriculture, Commerce, and the Interior.”*

Response: Acknowledged.

Comment: 11) p. 9-7, line 277: *On page 9-4, line 122, it is stated the NEWTT was established in 1998. On page 9-7, line 277, it is stated that NEWTT was established in 1997.*

Response: Acknowledged.

Comment: 12) p. 9-9: *One quick comment on coyotes (should apply additionally to the white-winged dove as this species is native to Cuba, Hispaniola, Mexico and parts of the Southwest including Texas). In the document, the white-winged dove is considered nonindigenous (in one of the later modules), although it certainly could have flown to Florida, yet the coyote is not considered such.*

There has been evidence that coyotes were released intentionally in Florida by hunters to track with dogs in lieu of foxes as that practice of chasing foxes with dogs has now been deemed illegal by the FWC and no longer is permitted. There is also evidence that white-winged doves were illegally or unintentionally released in the Miami area in 1959 (Refer to Robertson, Jr., and Woolfenden: 'An Annotated Florida Bird List') from a private aviary and in central Florida by FWC in the 1970s (Kale, II and Maehr, 1990) to establish a new huntable resource (I assume) in addition to the native morning dove. Existing populations may have been supplemented by those arriving through natural range expansion from Cuba, Hispaniola or Texas providing today's viable and established populations. Same could be said for the coyote since in the old days red wolves and panthers kept their numbers in check.

Response: Acknowledged, the authors concur and will treat the white-winged dove as a range expansion.

Comment: 13) p. 9-11, *Where Herbicides Can Be Used: This section overall was well-written and provided clarification with regards to licensing issues or site-specific uses of herbicides. For clarification, perhaps a discussion on how herbicides may be employed to treat 'new' threats to CERP or EPA if those species are not specifically listed or identified on the label...What is the law or regulations concerning this issue specifically for species such as ficus microcarpa, java plum, shoebuttan ardisia, earleaf acacia, bischofia, climbing cassia, etc?? At least two different opinions or view points on this issue exist. A detailed answer could be placed under this section as well.*

Response: The authors question the need to specifically detail this information in this document given that herbicide regulations are clear in that it is the site that is labeled, not the plant species.

Comment: 14) p. 9-16 and 9-17, *under Animal Monitoring: The maps on this page and the top of the next page are hard to see and discern animal species distribution locations. In addition, the source of this mapping data is not given.*

Response: Acknowledged. The authors have added captions with source information to all of the figures, but these late revisions did not make it to the WebBoard in time for this review.

Comment: 15) p. 9-16, lines 611, 637, and 638: *For personal communication citations, identify the affiliation of the person being cited and list in literature cited at the end of the chapter.*

Response: Acknowledged.

Comment: 16) p. 9-20, lines 779 and 780: *For personal communication citations, identify the affiliation of the person being cited and list in literature cited at the end of the chapter.*

Response: Acknowledged.

Comment: 17) p. 9-20, third paragraph: A sentence or two about the mission of RECOVER would be of value such as “RECOVER is an arm of the Comprehensive Plan (CERP) responsible for linking science and the tools of science to a set of system-wide planning, evaluation and assessment tasks.”

Response: Acknowledged.

Comment: 18) p. 9-20, line 792: “They” include is confusing in that it is implied the “they” is a driver or stressor. A more appropriate sentence would be - “The CEM’s include the Florida Bay, etc.”

Response: Acknowledged.

Comment: 19) p. 9-23, Table 9-1: In Table 9-1, does winning mean that we are winning the battle or the exotic is winning?

Response: Winning refers to agency efforts. The authors will clarify.

Comment: 20) p. 9-25, Under Fish: For Rio Grande cichlid change scientific name from *Cichlasoma cyanoguttatum* to *Herichthys cyanoguttatus*. In addition, Grand is spelled incorrectly. Should be Grande.

Response: Acknowledged.

Comment: 21) p. 9-25, Under Fish: The scientific name for Pike killifish is spelled incorrectly. It should be spelled *Belonesox*.

Response: Acknowledged.

Comment: 22) p. 9-38, line 1183-1184 reference to Brandt 2005 - Today, it dominates the Refuge, infesting 70% of its habitats: I could not find this figure in the cited document; however, there is a statement that states that melaleuca and lygodium together occur in over 60% of the Refuge.

Response: Acknowledged.

Comment: 23) p. 9-39, line 1203: Language here incorrectly implies that the Refuge is only studying *Lygodium*, when in fact the Refuge is also treating *Lygodium*.

Response: Acknowledged.

Comment: 24) p. 9-43, Under Fishes: Other more common names or local vernacular for peacock cichlid include butterfly peacock and peacock bass.

Response: Acknowledged.

Comment: 25) p. 9-43, Under Fish: For Rio Grande cichlid change scientific name from *Cichlasoma cyanoguttatum* to *Herichthys cyanoguttatus*.

Response: Acknowledged.

Comment: 26) p. 9-44: *Change the scientific name for Orinoco Sailfin Catfish from Pterygoplichthys multiradiatus to Liposarcus multiradiatus.*

Response: Acknowledged.

Comment: 27) p. 9-54, *Under Fishes: Change the scientific name for Orinoco Sailfin Catfish from Pterygoplichthys multiradiatus to Liposarcus multiradiatus. In addition, Orinco is spelled incorrectly. The correct spelling is Orinoco.*

Response: Acknowledged.

Chapter 10: Responses to Peer Review and Public Comments

R. Thomas James and Joyce Zhang

PEER REVIEW PANEL COMMENTS

Comment: *This chapter, like the introductory chapter that I first reviewed (Ch.1A), presents a very helpful synopsis of activities by the District in WY2005 for the Lake Okeechobee Protection Program. The following questions and comments are offered in the spirit of strengthening the writing and providing additional clarification on some points for readers.*

Response: Thank you.

Comment: *Lines 38-39 – Was there an effort to quantify the P contribution from the “large amounts of P-laden sediments [that] were resuspended from the central lake”?*

Response: Monthly budgets indicate a net 95 mt added from sediments from August to October. (added language to text)

Comment: *Line 71 – Please briefly describe the in-lake remediation activities.*

Response: In lake remediation activities include: Dike removal on Ritta Island and pond apple reforestation efforts on Torry Island. (added language to text)

Comment: *Lines 99-101 – Please clarify the targets for water clarity and frequency of algal blooms; also please clarify what constitutes an algal bloom (Table 10-1 was very helpful, but given later).*

Response: Targets for water clarity is visibility to the bottom of the lake in the nearshore (1 m depth) region from May to September and no more than five percent of the samples of chlorophyll *a* having concentrations greater than 40 ppb. (revised text)

Comment: *Lines 107, 472, 477, 509, 511, 535, etc., Fig. 10-22 – Please change ha to km² for consistency. Also (line 107), change semicolon to comma.*

Response: Changes were made.

Comment: *Line 188 – Please briefly describe alternative technologies for nutrient reduction (or briefly mention examples)*

Response: Alternative technologies for phosphorus reduction include chemical treatment at dairy outflow and algal turf scrubber (ATSTM). Text was revised.

Comment: *Lines 268-269 – Please add SEs or SDs, n values.*

Response: Revised.

Comment: *Maps p.10-16 – It doesn't seem that the map keys (scales) match the report text (p.10-13); please check the maxima indicated in the keys (scales) for Dec. 2004 (TSS), Jan. 2004 (TP). Also, the scales are too small to see well; please enlarge.*

Response: Maps were revised.

Comment: *Lines 283-284, 286-288 – Previous studies (e.g. Zimba et al. work) indicated that periphyton (e.g. benthic algal mats in the littoral zone) are major primary producers of L. Okeechobee. Are any measures for periphyton considered? – why/why not?.*

Response: We are in year 3 of a 5 year study of periphyton attached to submerged and emergent vegetation in the near shore zone. Text was revised. We hope that some results will be reported next year.

Comment: *Map p.10-23 – Did Phlips et al. consider only TP, or TP along with other nutrients as indicated?*

Response: Phlips considered TP, TN, light and relationships to Chlorophyll a in these maps. The caption was revised to clarify.

Comment: *Map p.10-24 – The littoral zone stations seem very sparse; please clarify to help readers?*

Response: Littoral zone includes 12 sampling locations. This is a reduction due to previous optimization which removed redundant stations.

Comment: *Lines 331-338 – It would also be helpful to describe how the amount of P resuspended / yr (i.e., “internal loading”) was estimated to support Fig. 10-19 (very interesting figure, and important to include)..*

Response: Caption was revised to clarify these estimates

Comment: *Line 339 – Please briefly mention why calcium may be decreasing..*

Response: Three hypotheses are presented in revised text.

Comment: *Lines 351-352, and P.10-28 – It should not be expected that a simple Vollenweider-type model would work, or should be applied, to systems such as Lake Okeechobee – that model has been successfully applied to the clear, dimictic lakes with low abiotic turbidity (the model was developed based upon such lakes), not highly turbid, polymictic lakes with high abiotic turbidity.*

Response: The Vollenweider model was applied to Lake Okeechobee after being modified to shallow Florida Lakes (Kratzer, 1979) From 1973–1980, the accuracy was reasonable and the model was used to develop the original loading targets for Lake Okeechobee (See SFWMD 1981, SFWMD, 1997; Kratzer and Brezonik, 1984). The usefulness of the model since then is described in Havens and James (1997). A paragraph was added to discuss the chronology of this issue

Comment: Lines 356-357 – Please see comment for Lines 331-338. There likely is both “tremendous inter-annual variability of inflow to the lake (with associated P loads) and high inter-annual variability of “internal” loading from mixing / resuspension. It would be helpful to readers for the comparison to be included, if estimates of the internal source are available.

Also, excluding internal re-suspension, what comprises the other 20%? – direct atmospheric deposition? Please clarify (e.g. please add the information from lines 617-619 here, to help readers).

Response: The loading versus flow graph simply represents the proportion of the load attributed to flow (i.e. load=flow*concentration). The other 20 percent of the variability is contributed by the concentration in the inflowing water. The variability of the internal loading is simply represented by the yearly sediment accumulation and net sedimentation coefficient. The internal load has not been measured directly and cannot be reported. A sentence is added to clarify that TP concentration accounts for 20 percent of the variability in loads. A sentence is added at the beginning of the section to define the atmospheric deposition and to clarify total loads to the lake.

Comment: Lines 358-364 – I assume (based on mention in Ch.1A) that these numbers are “flow-weighted.” Please clarify the confidence intervals around these numbers; and, how did the actual data compare to these numbers? P.10-28 – are the “observed concentrations” “flow-weighted” in this (lower) figure? Again, please clarify – what are the CIs? And, how were the trend lines determined? (the reader is referred to Vol. 1 of previous year’s report, but please briefly mention the statistical model(s) used here, and for Fig. 10-18).

Response: Trend lines used in the figures are five year moving averages which remove a large amount of interannual variability; these are described in the captions. Confidence intervals have not been established, but will be important in the future as we approach our target goals.

Comment: P.10-29 figure legend, line 3 – please change to ...between water year external phosphorus loading...

[Assumption - the actual P loading available to phytoplankton and other biota would have been from external + internal resuspension sources, considering TP rather than SRP in order to account for luxury uptake.]

Response: Revised.

Comment: Lines 367-374 – Please further clarify; what did the references cited actually report, and what periods (years) were analyzed?

Response: Revised.

Comment: Figure 10-19 – Why is the information restricted only to inorganic P, when the writing throughout refers to total P? Please clarify. Also, please comment on the organic P fraction if the information is available (is anything known about the percentage that is bioavailable, and potential importance to the phytoplankton? I would assume that there should be arrows representing the use of at least a portion of the organic P by the phytoplankton, based on amassing literature supporting the importance of some organic P moieties as P supplies).

Response: The figure represents the pathways of the Lake Okeechobee Water Quality Model. There is no uptake specified in the model between organic P and algae. Organic P fraction is not

directly available. Based on the assumption that SRP is inorganic then TP – SRP would equate to the organic fraction. The text on the LOWQM model has been revised to clarify.

Comment: *Line 389 – Please clarify – what other two algal groups?*

Response: green algae and diatoms (Revised).

Comment: *Line 411 – Please reword (periphyton are not SAV).*

Response: Revised.

Comment: *Line 431 – no hyphen in macroalgae.*

Response: Revised.

Comment: *Line 451 vs. line 107 – Discrepancy in the SAV acreage; please check.*

Response: Correct value is 54,857 acres (Revised).

Comment: *Lines 498, 506 – please move the scientific name on line 506 up to line 498.?...*

Response: Revised.

Comment: *Line 493 – please briefly describe the extensive groundtruthing.*

Response: Stratified random samples of plant communities were located and coordinates determined. These 200 coordinates were visited in the field to estimate thematic and spatial accuracy. (Text revised).

Comment: *Lines 489-490 – Please briefly describe how it was determined that 5-7 yr (most recent, 7 yr apart) is sufficient.*

Response: The time was to optimize cost, staff time and ability to detect changes. (Text revised).

Comment: *Line 536 – Please mention how treated.*

Response: Mature stands were burned (conditions permitting) and new growth was chemically treated. (Text revised)

Comment: *Line 566 – Define CPUE (catch per unit effort)*

Response: The number of fish caught per minute of fishing or fish minute⁻¹ (Text revised).

Comment: *Line 607 – Alter as: ...percent of the total external loading...?...*

Response: Revised.

Comment: *Line 610 - Weekly to monthly TP sample collection is a major difference; please further clarify.*

Response: The TP samples on major tributary basins were collected on a weekly basis. TP samples on other sites were collected on a biweekly or monthly basis. (Text revised)

Comment: Lines 617-619 – It would be helpful (e.g. back ~lines 356-357) to clarify the estimated amount of atmospheric deposition loading to the watershed, as well.

Response: Revised.

Comment: Lines 624-628 – Did JGH Engineering’s budget include atmospheric sources? Based upon Table 10-4 (p.10-50), apparently not? If not, please clarify; and also clarify in the Table 10-4 legend.

Response: The table caption was revised to clarify that Atmospheric Deposition is not included.” The sentences (lines 624-628) also clearly define the legend.

Comment: Lines 665-669 – Please restructure sentence.

Response: Revised.

Comment: Line 904 - Why was the Green-Cycle/QED canceled? – Please clarify.

Response: The Green-Cycle project was canceled due to non performance on the part of Green-Cycle. The District is exploring other options to address the issue of residuals in the watershed.

Comment: Lines 1001-1003 – Why are only 7 classified as NPDES facilities?

Response: The seven facilities have surface water discharges, which require NPDES permits according to state and federal rules. The other facilities do not have surface water discharges that require NPDES permits. (Text revised)

Comment: Lines 1008-1023 – Have pathogenic microbes been considered? Is data available?

Response: Pathogenic microbes have not been considered because bio-solids or septage are required to be treated before land application.

Comment: P.10-67, third project in Table 10-7 – Will long-term maintenance questions also be addressed by this project or elsewhere?

Response: The Wetland BMP Research currently is not looking at long-term maintenance, but it is a future goal to look at if the phosphorus removal of these BMPs proves to be effective and if funding is available for future study. (no change to text)

Comment: Page 10-67, last project in Table 10-7 - How can it be that cattle stocking rates have no measurable effect on nutrient loads from the pastures?

Response: Cattle stocking rate had no measurable effect on nutrient loads or concentrations in surface runoff from pastures monitored over a six-year period. The major influence on runoff nutrient loads was past use of P fertilizer. Phosphorus loads in years with significant runoff were 5 to 7 times greater from improved pasture than from semi-native pasture. (no change to text)

Comment: P.10-68, first project – one year (“a full dry/wet cycle”) does not seem to be an adequate period for assessment, based upon the high inter-annual variability in precipitation/runoff described in this chapter.

Response: A full dry/wet cycle should be an adequate period because the preliminary results indicated very little movement in P over time. (no changes made)

Comment: *P.10-68, last two projects listed– Where will the dredge spoils be discarded?*

Response: For Taylor Creek tributary dredging material, soil test has turned up no constituents of concern so it will not be necessary to truck the material to the landfill. The material will be land applied on near by agricultural operations as a soil amendment. (Text added) The soil analysis for the Lake Istokpoga Canal Project has not yet been conducted.

Comment: *What is the frequency of the USGS sampling? (Lines 1160-1165)*

Response: Continuous flow sampling and weekly water quality sampling. (Text added)

Comment: *Lines 1355-1357 – It would be helpful to readers to know the extent of occurrence/abundance of each of these species in Lake Okeechobee (e.g. exotic, Hydrilla).?...*

Response: A link to these maps (noted below) was already presented earlier (no changes)

http://www.sfwmd.gov/org/wrp/wrp_okee/2_wrp_okee_inlake/savmaps.html

Comment: *Figure 10-34 – Why is there no mention of periphyton other than epiphytes? Haven't benthic periphyton mats been shown to be important contributors to the primary production of Lake Okeechobee??...*

Response: The model in question was developed specifically for SAV. Attached epiphytes were included in the model because they are intimately associated with SAV and play a major role in the way in which the SAV community transforms, recycles and sequesters nutrients. Benthic mats are primarily important in the interior marsh rather than in the nearshore littoral zone where most SAV growth occurs. (added language to specify epiphyte role)

Comment: *Lines 1375-1385 – The rationale of only two treatments seems weak; are there plans to test more treatment levels and Lines 1386-1391, Figure 10-36 – were these experiments just +/- light, or were light levels also tested??...*

Response: We have begun by trying to determine whether each of the major SAV species in the lake has a light absolute requirement for germination. This is an important input to the way our SAV model runs. Eventually, we will go back and examine the specific light level needed by each species for germination, but this will be a long term effort. (language added)

Comment: *Line 1409 – Please clarify benthic algae – macroalgae only? Periphyton (if so, which?)?*

Response: Benthic algae, in this case, referred to whatever colonized the unplanted substrates in this experiment. Although we didn't look at the specific taxonomic composition of the mats, they appeared to be comprised mostly of filamentous blue green algae. (added language to clarify)

Comment: *Nice insight on lines 1418-1420.?...*

Response: Thank you.

Comment: *Figure 10-38 – Include periphyton??...*

Response: The LOEM model currently does not include periphyton. Future enhancements may add this component. (no changes made)

Comment: *This chapter is a very clear summary of limnological conditions and plans for recovery of Lake Okeechobee. It is well written (and technically sound) and the authors should be commended for making efforts to draw linkages among all the different pieces of information presented. The illustrations and tables used are pretty clear overall, and useful. It is also well referenced, with a good mix of peer-reviewed journal articles, and agency publications.*

Response: Thank you

Comment: *Page 10-1, line 29. Make clear that the phosphorus goal of 40 parts per billion is a total phosphorus goal.*

Response: Clarified.

Comment: *Page 10-5, line 221-222. Widespread inundation of urban and agricultural lands resulted not only in an increase in phosphorus runoff during and after the storms. I think you have to mention here that also other nutrients like nitrogen and pollutants like pesticides may have an increased runoff during and after storms.?...*

Response: Pesticides, nitrogen and other class I/III variables are being monitored but have not been analyzed for this chapter. We cannot speculate on the impact of hurricanes on these parameters.

Comment: *Page 10-25, line 349. Why is there a reduction of water-column calcium??? And when calcium is important in sequestration of phosphorus in the sediment of the lake, why is it not an option to add calcium to the lake sediment? In the Netherlands addition of calcium is used as a measure to restore acidified lakes.?...*

Response: Hypotheses regarding Ca reduction were added. Chemical treatment using Ca has been considered as a method for sediment management in Lake Okeechobee. Although potentially feasible the costs are high and reapplication may be necessary if external loads are not reduced (BBL, 2003). A paragraph was added to further discuss this issue.

Comment: *Page 10-31, line 388. Only here and in table 10-1 page 10-21, nitrogen is mentioned as an important nutrient in determining algal growth in particular the presence of toxic cyanobacteria. One major technical comment about the chapter is that water quality is virtually synonymous with phosphorus only. In Lake Okeechobee (not true of other parts of the Everglades, though), phosphorus does appear to be the major water quality issue. Except for nitrogen, other potential water quality issues are essentially ignored in this chapter. For example, what about organic contaminants (herbicides and pesticides) and their impacts on lake aquatic organisms? How do high levels of sulfate in the lake water affect sediment redox chemistry, sulphide build-up, trace metal micronutrient cycling, methylmercury production in the lake, and what are the impacts on biota? Increased sulfur loads originating from polluted surface water and groundwater, and from enhanced atmospheric input, are a major threat to the biogeochemical functioning and biodiversity of freshwater wetlands.?...*

Response: The focus of the Lake Okeechobee Protection Plan and this summary is Phosphorus. Although other Class I/III and nutrients are measured and are important, the limited staff and other available resources are not sufficient to respond fully to these comments. We have included WY2005 and WY2001–WY2005 averages for TN, TP, SRP, DIN in Table 10-1 and discuss this in the text.

Comment: *Page 10-33, line 409-413. In the summary of the processes through which SAV is influencing the biomass of phytoplankton and transparency of the lake water I miss the role of SAV as refuge for zooplankton against predation by fish. A higher biomass of zooplankton may lower the phytoplankton biomass and consequently increase the transparency. Also allelopathic substances excreted by submerged plants like Characeae (dominant plant in the lake) may lower the growth of phytoplankton and periphyton. Further may SAV around their roots stimulate denitrification by bacterial communities.*

Response: A section on the zooplankton research conducted to date was added.

Comment: *Page 10-41, line 542. I miss in this paragraph some information about the impact of the fish on the food web in the lake. Are some of these fish planktivorous or herbivorous?? A high biomass of planktivorous fish may have an impact on the transparency of the lake by a decrease of the zooplankton biomass resulting in an increase of the phytoplankton biomass.*

Response: To date, there has been very little work done on the non-sport fish component of the fish community of Lake Okeechobee. The first year of a 3 year study examining non-sport fish will be commencing in FY2006 which is stated in the paragraph. “Starting in 2006, RECOVER is expected to include systematic sampling of all species of fish in the lake so that updates in 2007 and beyond will include more comprehensive information.” (no changes made)

Comment: *Page 10-55, line 779. What is a baffle box?*

Response: The baffle box is for trapping sediments and trash. (text added)

Comment: *Page 10-57, table 10-6. What was the chemical treatment of the runoff at the Davie Dairy 1 and 2?*

Response: The chemical treatment of runoff at the Davie Dairy 1 and 2 is alum (aluminum sulfate). (text added)

Comment: *This chapter is an excellent update to the similar chapter in the 2005 SFER. It includes data on the effects of the 2004 hurricanes on Lake Okeechobee and integrates that information into the much longer term record that has been compiled for this lake. The focus is on TP, its loading (external and internal) to the lake, the physical, chemical, and biological mechanisms that operate to cycle TP within the lake, the biology of the lake supported by and influenced by TP, and the various ways that TP loading to the lake is being controlled to bring the loadings in line with TMDL limits set for it. Lake Okeechobee and eutrophication processes associated with it have been studied extensively for a long period of time, and more may be known about Lake Okeechobee than most lakes in the world. The hydraulic and TP loads imposed on the lake in 2004 with the hurricanes have provided a unique opportunity to study the impacts of short-term major loads to a lake like Lake Okeechobee and the downstream impacts associated with that loading as well as the major disruption to the biota and sediments caused by the currents generated during the seiche created by the hurricane winds. While an excellent database exists for Lake Okeechobee on which to base management decisions, there is still much to learn*

about the lake and managing its water quality. Noticeably absent from this chapter is a presentation on one of the basic elements of water quality management, namely the water quality modeling that has been ongoing for so many years. Simplified models such as Vollenweider's models have been applied with success, but more sophisticated models such as the EPA model WASP were being applied to the lake. Are these efforts ongoing? If various management scenarios are to be offered and tested, a series of models from the simple to the complex will need to be available for the lake to understand the consequences of those scenarios.?...

Response: Model efforts continue. The details were left out since these models are now considered analysis tools. We are continuing to develop and improve the Lake Okeechobee Water Quality Model and the Lake Okeechobee Environment models. (no added text)

Comment: *Line 343: Should 187 mt/yr be 197 mt/yr as given in Table 10-2? Also, why are the Net Sedimentation Coefficient's given as negative values. If the TP mass balance equation used for the Vollenweider model is used here, then these values should be positive; a negative value would imply that the lake is a source of TP rather than a sink. Finally, how the Net Change in Lake Content values were obtained is not clear, for the differences in Lake P Mass from year to year do not match the Net Change in Lake Content values.?...*

Response: Line 343 was corrected. The sign was changed on coefficient values to indicate a net accumulation to the sediments with a positive value. Net change in lake content is the difference between the May estimated mass value in the next year and the May estimated value in the current water year (see table footnote). This is consistent with previous publications on Lake Okeechobee P budgets (Janus et al. 1991, and James et al. 1995)

Comment: *Lines 351-352: It is not clear whether the 1975 or the 1976 Vollenweider model is being applied here or what is meant by a Vollenweider-type model. Further, has the loss rate coefficient in the models been adjusted for Lake Okeechobee's conditions??...*

Response: The modified Vollenweider model developed by Kratzer (1979) is used to replace the 1976 Vollenweider model that was presented, because the Kratzer model was modified for shallow Florida Lakes (figure revised, text added)

Comment: *Lines 367-374 – Please further clarify; what did the references cited actually report, and what periods (years) were analyzed?...*

Response: Information was added regarding Janus et al. (1991) and Canfield and Hoyer (1988)

Comment: *Figure 10-19: Please explain the TP flux values between the water and Active Sediment Layer; it's not clear how a flux balance can be attained without knowing the direction of the fluxes.?...*

Response: The caption was modified to explain that fluxes out of the water column and out of the sediment to buried sediment are negative, while fluxes in are positive.

Comment: *Figure 10-26: What caused the large upturn of catch rate in 1984-89? It appears that the catch rate was steadily declining in the 1970s and in the 1990s and 2000s.?...*

Response: 1976 through about mid-1980 there was a large scale commercial harvest program (OFUMP) on the lake: wire traps trawls, haul seines, hook-n-line, everyone could sell black crappie, bluegill, and redear sunfish. The crappie population was so dense that the fish were

stunted, rarely exceeding 180 mm. OFUMP crashed the population and in 1981 we had, at that time, a historical drought. The high densities in the early-mid 80's were the result of a greatly reduced population responding to expanding excellent environmental conditions, essentially the "new impoundment" scenario. Because of the good conditions the year classes produced were strong and survived for a longer period, 7- 9 year old fish were common. However, by the mid 80's we were starting to see depressed growth rates due to the high densities. See Miller, *et al.* 1990. (Added Text)

Comment: *Line 646, Table 10-3: It is not clear whether the 35 mt TP for Rainfall represents only the wet flux of whether it is wet flux + dry flux. Please clarify.?...*

Response: Atmospheric deposition is defined as the sum of wet and dry flux. Language was added to define this term.

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

Comment: *In this chapter it is stated that it was determined that sediment removal from the lake would not be effective in reducing internal phosphorus loading and that alternative measures, like large pits dug in the lake bottom to trap P-rich sediment material, are not feasible. Clear reference to The Lake Okeechobee Sediment Removal Feasibility Study should be included and brief description..*

Response: A paragraph describing the findings of this study was added. A link to the webpage with the report is included in the report.

Comment: *Research should address the possible role of sulfate on the mobilization of phosphate. It is known that an increase in sulfate can increase mobilization of certain nutrients, especially phosphate, from the sediments. This may be an important part of the internal eutrophication. A monitoring program for measuring nutrients other than phosphorus (especially inorganic N forms, total N) is recommended (compare to the monitor program in the Everglades).*

Response: This topic will be considered for future application. The monitoring program does go beyond the areas that were reported. They were not included because the focus of our programs is phosphorus.

Comment: *Fish populations are important to the substantial fisheries on the lake, and may strongly affect phytoplankton and other water quality issues, but receive little attention in this chapter. More information should be included about the impacts of the fish on the lake food web..*

Response: This will be addressed as monitoring continues.

Comment: *Seepage/leachate from land-deposited sludge (residuals or biosolids) and septage should be monitored for pathogenic microbes (e.g. fecal bacteria, enterococci, Clostridium perfringens, coliphages) as well as nutrients*

Response: Septage is treated to remove pathogenic microbes before it is spread on land, therefore no monitoring of pathogens is needed.

Comment: *Several full dry/wet annual cycles should be included in the dairy lagoon seepage project (p.10-68) in order to determine effects on phosphorus movement.*

Response: Results already indicate little movement of phosphorus through one dry/wet cycle. Further studies will be considered.

Comment: *More connections should be made with the other chapters. For instance, the Kissimmee River is a major source of water and materials to the lake, which in turn supplies water and materials to the EPA, the St. Lucie Estuary, and the Caloosahatchee Estuary. These connections should be addressed more explicitly..*

Response: These connections will be addressed in next years report..

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: *General: This chapter was well written (and technically sound) and the authors should be commended for making efforts to draw linkages among all the different pieces of information presented. The chapter is informative, and clearly represents the diverse talent of the authors. The illustrations and tables used are pretty clear overall, and useful. It is also well referenced, with a good mix of peer-reviewed journal articles, and agency publications. The information was useful in understanding how the Lake Okeechobee Protection Program (LOPP) will complement work being conducted by the Lake Okeechobee Watershed Project (LOWP) of CERP.*

Response: Thank you.

Comment: *p. 10-1, Line 12: should be "Everglade snail kite", not "Everglades snail kite"... This error appears again on Line 153 page 10-4.*

Response: Revised.

Comment: *p. 10-1, line 34: Please add the word "volume" after "average water year inflow".*

Response: Revised.

Comment: *p. 10-2, line 41: Please change "resuspended" to "resuspend".*

Response: Revised.

Comment: *p. 10-2, line 44, and elsewhere in document: Please ensure that the term "significant" is used only when referring to statistical significance at a given confidence level..*

Response: In this case the value is statistically significant. Text revised and where statistical significance was not defined or forecast the word was changed.

Comment: *p. 10-2, line 58: Please add the term "highly variable" or something similar before "lake stages.*

Response: Revised.

Comment: *p. 10-2, line 62: "...that has greater environmental benefits": Would the statement "...that has fewer negative environmental impacts" be more appropriate here?*

Response: We wish to keep the emphasis optimistic (half full) rather than pessimistic (half empty).

Comment: *p. 10-3, line 84: states that the CERP ". . . will provide substantial amounts of water storage and approximately 39 percent of the phosphorus load reduction needed to meet the TMDL. . ." The statement is premature. It should read, "As currently planned, the intent of the LWP component of the CERP is to remove 39 percent of the total phosphorus load and store approximately 280,000 ac-ft of water."*

Response: Revised.

Comment: *p. 10-3, line 95: What is the WY2005 average of water column TP in relation to the 5-year average (have to find it on p. 10-25)? Please describe to the reader why a 5- year average is presented. For example, a 5-year average is used in Table 1 showing TP concentration at 77 ppb (1999-2003), and a near-doubling to 142 ppb from 2001- 2005, but no discussion is provided.*

Response: The five year average was used for three reasons: (1) consistency with the TMDL which specifies a five-year rolling average, (2) reduced interannual variability due to variation in climate and hydrology, and (3) define trends over time. The five-year average from 1999–2003 is 104 ppb, which is not a doubling but is about 75 percent of the current value but only 84 percent of the 2000–2004 value. The increase in 2001–2005 can be attributed to the hurricanes. A paragraph describing trends of water column concentrations was added.

Comment: *Page 10-3, line 122: Please identify the agency who removed berms surrounding Ritta Island.*

Response: The berms on Ritta Island were removed by a private contractor under the direction of the FWC.

Comment: *Page 10-3, line 126: Why are berms on Kreamer and Torry Islands not being removed?*

Response: The berms on Kreamer and Torry Islands will be not removed because the only one remaining on Torry Island is severely breeched and is not worth removing and there is sufficient exchange of flow between the island and the lake. We received a lot of resistance from the fishermen regarding the removal of the large berm on Kreamer Island, so we decided not to remove it at this time. We were going to wait and see how Ritta turned out first and monitor the effects before going back to Kreamer. (no text added)

Comment: *p. 10-4, line 156, or somewhere in document: Please identify the primary exotic and nuisance plants in the study area..*

Response: Added in section on Vegetation management activities.

Comment: p. 10-5, Fig. 10-1: Please give a general idea of what you mean by “Past” – is this prior to 1920s/1930s, when the dike system was constructed?.

Response: This is pre 1920s (added to caption).

Comment: p. 10-6, Fig. 10-2: Please add a key or legend defining “L” and “C”.

Response: Caption revised to define legend L-levee and C-canal

Comment: p. 10-7, line 173: If possible, please add a reference for the source of the atmospheric deposition estimate. I continue to be concerned about the accuracy of this estimate. I was under the impression that data collected from atmospheric deposition stations within the lake were unreliable due to contamination of sampling media (i.e. bird excrement) and other problems. Does the TMDL allow a constant estimate for atmospheric deposition? If true atmospheric deposition is determined to be much higher than expected, would the tributary load TMDL have to be reduced to meet the in-lake phosphorus concentration goal?.

Response: The Atmospheric Deposition is a constant value specified in the FDEP (2001) TMDL report. This value was a consensus of the panel based on a presentation by Curt Pollman. The FDEP report is cited when atmospheric deposition is defined in the document.

Comment: p. 10-7, line 173: Please define mt (metric tons) somewhere in the document.

Response: Defined.

Comment: p. 10-8, lines 208-215: Where was the water from the dairy lagoons pumped – into a nearby ditch? Did the WMD observe any water quality impacts to nearby streams as a result of the pumping?

Response: Water from the 3 dairy lagoons was pumped on adjacent pastures away from ditches or tributary drains. This was done to minimize the potential of direct runoff into surrounding tributaries. Due to the large amount of water that covered the watershed after the storms there was no way to substantiate any cause and affect on phosphorus concentrations resulting from farm management decisions or the pumping of water from the 3 dairy lagoons on adjoining pastures. (Text revised)

Comment: p. 10-8; Line 225: "Estimated currents velocity" . . . Remove the "s" on "currents".

Response: Revised.

Comment: p. 10-9, Figure 10-3: Please add dates of each hurricane’s landfall to the figure..

Response: Revised caption.

Comment: p. 10-13, line 242: Please add “post-hurricane” after the word “Direct”..

Response: Revised.

Comment: 10-13, line 259: *Why do you think that the results of the lake sampling showed lower concentrations of suspended solids and phosphorus in January and April? Was it due to fewer cold fronts or storms during or just prior to these months? An interesting exercise would be to try to correlate certain weather parameters (e.g. number of days in month with rainfall > 0.5 in, number of days with wind speed > 20 mph, etc.) with observed in-lake water quality concentrations..*

Response: This is addressed in Figure 10-8B which shows the relationship between antecedent wind speed and total suspended solids. Also, reworded paragraph to clarify the relationships.

Comment: p. 10-13, line 261: *Add “under quiescent conditions” or a similar statement after “...completely from the lake water”..*

Response: Revised.

Comment: p. 10-13, line 267: *Please replace “our” with “SFWMD”..*

Response: Revised.

Comment: p. 10-13, lines 265-272: *Could some of the decline in SAV biomass over this period be attributed to seasonal effects? I would expect that SAV would naturally decline somewhat with temperature and natural weather patterns from July to April.*

Response: Yes but these are minor compared to the tremendous decline. Revised to mention seasonal effects.

Comment: p. 10-15, Figure 10-8: *Please move the R2 value for the upper graph closer to the regression line, as shown in the lower graph. Are the regressions statistically significant? Please state the p-value of the regressions below the R2 value..*

Response: Revised.

Comment: p. 10-16, Figure 10-9: *The scale font for each of the isopleth maps is difficult to read I suggest enlarging the font.*

Response: Revised.

Comment: p. 10-17, Figure 10-9b: *It is interesting that the water-quality patterns in the lake for February are distinctly different from patterns in other months (there are 2 distinct mounds of high concentration). Did sampling locations vary during this sampling period? It might be helpful to state the lake’s water level elevation at the time of each sampling event beside the isopleths.*

Response: No change in sampling locations occurred. Differences can be attributed to changes in circulation and resuspension (sentence added).

Comment: p. 10-19, Figure 10-11: *Since sampling is conducted quarterly, I suggest you show only the months sampled on the X-axis. As it is, the figure is a bit misleading – it appears that SAV biomass was 0 during the months not sampled..*

Response: Revised.

Comment: p. 10-19, figure caption: Note in the caption that the months with no biomass presented are months where samples were not taken, not months where no biomass was found.

Response: Revised.

Comment: p. 10-20, line 300: Please add the word “and” after “water quality”..

Response: Revised

Comment: p. 10-21, Table 10-1: Excellent table – this is very helpful!.

Response: Thank you.

Comment: p. 10-25, line 340: If atmospheric deposition is estimated, add the word “estimated” before “atmospheric deposition” to differentiate it from measured tributary loads.

Response: Revised.

Comment: p. 10-25, line 344: Please further define “net sedimentation coefficient”. Also, the symbol used to denote the coefficient in the text is different in Table 10-2.

Response: Revised.

Comment: p. 10-25, line 349: Does the WMD sample for calcium in the lake? If not, it would be a relatively inexpensive addition to the sampling program and useful to further define phosphorus assimilation dynamics.

Response: Calcium is monitored (added statement to that effect).

Comment: p. 10-25, line 351: I’m not sure that the under-prediction of TP by the model is a “result” of the assimilation trend. I suggest using another word..

Response: used “attributed to” .

Comment: p. 10-28, Figure 10-16, top graph: What does the one negative sedimentation coefficient (in 1998) imply – that the outflow of sediment exceeded the inflow?.

Response: Not exactly, the net load (outflow-inflow) is less than the change in lake mass (May to May), i.e. the sediment in this year was a net source of phosphorus to the water column (added a sentence to clarify).

Comment: p. 10-32, Figure 10-19: It is very difficult to visualize the interactions depicted in this diagram. Could it be revised to look like Figure 10-38? Also, what’s the difference between the solid and dashed flux arrows?

Response: The caption for figure 10-19 was revised to clarify the interactions. The short amount of time available prohibits revising this figure to look like Figure 10-38.

Comment: p. 10-33, line 444-446: The WMD is to be commended for their efficient data collection and map development process.

Response: Thank you.

Comment: p. 10-33: What would provide valuable information on the level of uncertainty in the assessment of the 1 x 1 km SAV sampling program would be a comparison to the 0.5 x 0.5 km grid used in the first year of the monitoring program.

Response: Due to time limitations, this will be considered for next year's report.

Comment: p. 10-36, Figure 10-21: The squares representing grids with "no plants present" are shown in blue on the figure and in white on the key.

Response: Revised.

Comment: p. 10-39; Line 479; two misspellings.... "Everglades snail kite (*Rostrhamus sociabilis plumbeus*)".... should be "Everglade" and "Rostrhamus"

Response: Revised.

Comment: p. 10-41, line 536: How were the torpedograss and cattail treated – chemically, burned, or physically removed? Please add a brief explanation to the text.

Response: Language added (its both).

Comment: p. 10-41, line 537, "submersed": Do you mean "submerged"?

Response: Revised.

Comment: p. 10-41, line 557, and Pg. 10-42, line 569: Just to satisfy my own curiosity Why were October and January selected for sampling of largemouth bass and black crappie, respectively?

Response: Historically, FWC sampled quarterly for both species. Staff reductions required streamlining. They conducted extensive monthly sampling to determine time of annulus formation in large mouth bass (LMB), crappie, redear and bluegill. The timings are primarily bracketed around annulus formation in the otolith for age and growth work. Fall for LMB prior to a spawning check on otolith, substantial LMB spawning can commence in Dec. Any YOY LMB in the fall is more than likely to contribute to the adult population and we have a more realistic handle on recruitment. Same for crappie, age growth oriented, January is the best. Also, if you will note from previous work that quantitative blocknetting was conducted in the fall, the interest is recruitment into the adult population, not the level of production. (no changes to text)

Comment: p. 10-42, lines 572-588: Does the water quality of the lake (other than turbidity) have any other impacts on the health of bass and black crappie populations, other than indirect impacts through habitat loss? If so, please state..

Response: Indirect impacts only, at least for the parameters that we routinely measure and report. No changes are made in the report.

Comment: p. 10-44, Figure 10-26: Please give units for the y-axis.

Response: Revised.

Comment: Page 10-46, Figure 10-27: I believe the LOWP (CERP) boundary now, technically, includes Nicodemus Slough.

Response: The CERP boundary does not include Nicodemus Slough even though some parcels in Nicodemus Slough could be used as a place to site a reservoir and STA for treatment of Fisheating Creek water (no changes made).

Comment: p. 10-48, Table 10-3: I suggest converting the last two sentences of the table caption into a footnote. Also, add the word “Average” above “TP Concentration” in the table.

Response: Revised.

Comment: Page 10-53, line 680: *What incentives does FDACS offer to farmers who participate in the voluntary BMP program?*

Response: The "incentive" refers to cost share. In general, farmers are eligible to receive between 75 and 87.5 percent cost share, either through FDACS or (preferably) a combination of FDACS and NRCS funds. This is also highly dependent upon the farmer's county of residence, the availability of federal funds and their eligibility for federal funds. (Text added).

Comment: Page 10-53, line 718: *I suggest removing the phrase “a certified technical service provider”.*

Response: Revised.

Comment: Page 10-54, line 772: *What is the timeframe for developing stormwater master plans?*

Response: The stormwater master plans have been developed for large cities. The Okeechobee Service Center works cooperatively with Okeechobee County to add more details to the plans. (Text added).

Comment: Page 10-55, line 786: *How will the success of FDEP's public education programs be measured? Public surveys?*

Response: UF-IFAS monitors the number of people that they provide assistance to or receive information request regarding the Florida Yards and Neighbors Program. Surveys would not work in this area.

Comment: Page 10-64, line 1077: *Was the STA for Taylor Creek completed in July 2005 (the draft chapter is dated 18 August 2005)?*

Response: The STA for Taylor Creek was completed in early fall of 2005 (outside the reporting period for this document i.e. prior to April 2005). No changes made.

Comment: Page 10-64; Line 1084: *The report states “The Byrd Isolated Wetland Critical Project was completed in June 2002.” However, no other details are provided. What is the significance of this statement?*

Response: Removed.

Comment: Page 10-65 or elsewhere in the report: *I suggest adding a couple of sentences describing the coordination among all agencies involved with the lake's restoration. With all of the projects and activities described in the report, it is apparent that there must be a high level of*

communication among agencies (particularly those involved with CERP and LOPP) so as to avoid redundancy and conflicts of interest, and to ensure a common goal.

Response: It has been stated on various locations that the SFWMD, FDEP, and FDACS are leading agencies for implementing the phosphorus control program. Approximately thirty agencies and interested parties have been involved this effort. It is not necessary to list all agencies involved. No changes are made.

Comment: *Page 10-69, line 1162: Please replace “U.S. Geological Survey” with “USGS”, as the acronym has already been defined earlier in the document.*

Response: Revised.

Comment: *Page 10-69, line 1163: Please add the phrase “for phosphorus, nitrogen, and total suspended solids loads and streamflow” after “....north of Lake Okeechobee”.*

Response: Revised.

Comment: *p. 10-73, line 1275: Should a new sentence begin after the word “estuaries”?*

Response: Revised.

Comment: *p. 10-77, all lines: It may be interesting to study the effects of wave height and wave patterns on suspended sediment, deposition of sediment, and SAV location and extent. The USGS is operating a similar study in the Indian River Lagoon to examine the effects of wave height and wave patterns on sediment transport and the proliferation of sea grass beds, using acoustic Doppler wave profiling equipment. This type of study could easily be adapted to the Lake Okeechobee environment and may assist with efforts to model lake hydrodynamics. We would be interested in discussing this further with the LOPA team.*

Response: Some of this has already been done for Lake Okeechobee. We will be glad to discuss it further.

Comment: *p. 10-83, Figure 10-38: Excellent figure.*

Response: Thank you.

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Havens, K.E. and R.T. James. 1997. A Critical Evaluation of Phosphorus Management Goals for Lake Okeechobee, Florida, USA, *Lake and Reservoir Management*, 13: 292-301.

Miller, S.J., D.D. Fox, L.A. Bull and T.D. McCall. 1990. Population Dynamics of Black Crappie in Lake Okeechobee, Florida, Following Suspension of Commercial Harvest. *North American Journal of Fisheries Management*, 10: 98-105.

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Chapter 11: Responses to Peer Review and Public Comments

Gary Williams, David Anderson, Dave Colangelo,
Lawrence Glenn, Brad Jones, Chris Carlson and Joseph
Koebel

RESPONSES TO PEER REVIEW PANEL COMMENTS

Comment: *The conceptualization of parameters affecting this region, such as the effect of hurricanes on DO, is extremely useful, and can serve as a model for adaptive management. How does the low DO influence the phosphorus release from the sediments? Have there been some measurements on the possible higher release of P (pp. 11-49)? Also, denitrification may increase.*

Response: We do not know of any data that show the relationship between low DO and P release from sediments for the Kissimmee River. However, we are aware that this relationship is well documented in the literature. We would need to design an experiment to answer this question specifically for the Kissimmee River.

Comment: *How deep were the sites where DO data were taken (mean depth, ranges)? Why was DO monitored at only one depth (1 m)? Also, what time of day were the DO measurements taken? A serious limitation of the monitoring design is that monthly data, and data collected during the light period, are insufficient to detect DO sags, which are important in controlling the survival of aquatic life.*

Response: Sampled remnant river runs were approximately 20 - 30 m wide and 2 - 3 m deep, with little or no flow. For several months before and after phase I of the restoration, weekly DO depth profiles (DO sampled at 0.5 m and each meter thereafter to 0.5 m above bottom sediment) were taken at four stations within remnant river channels. These data will be incorporated into the final chapter.

Monthly and weekly sampling took place generally between 1100 hrs and 1400 hrs. We also collect continuous (sampled every 15 minutes) DO data at three stations within the river channel. These continuous stations were established in areas that are considered representative of the impact and control areas as a whole. Continuous monitoring stations are used to detect DO sags as well as to evaluate the DO metrics.

Comment: *The 10-year storm event for flood control of the Kissimmee Basin seems much too short, given changing land use, climatic conditions and possible global warming events. The role of increased runoff due to urbanization seems to require extensive modeling and data collection. There is an excellent discussion of the factors affecting hydrology of the Basin, and could be more information about possible solutions or co-management options.*

Response: To be added.

Comment: The inclusion of stakeholders in the plans for the Kissimmee Chain of lakes is an excellent idea, and will provide a mechanism for many end users to obtain the necessary information to understand both the biological and human dimensions of the system. It may also help to involve stakeholders in the development of brochures and performance measures.

Comment: *Colangelo; Are data available on the phytoplankton (abundance, dominant taxa)? And, were these phytoplankton (i.e., true potamoplankton, characteristic of large, slowly flowing lower river systems) or suspended microalgae?*

Response: Kissimmee River baseline phytoplankton data were reported in SFER 2004. Phytoplankton data will be collected and changes from the baseline condition will be evaluated after the Headwaters Revitalization plan is in effect.

Comment: *The interactions between water-level management and Hydrilla control in the lakes should be better described. What are plans for control of Hydrilla in these lakes? How will future management of water levels in the lakes affect Hydrilla? Will it increase or decrease the problem? Is there no other treatment than chemical treatment possible against Hydrilla?*

Response: Specific plans for hydrilla control are directed by the Florida Department of Environmental Protection's Bureau of Aquatic Plant Management. Because of widespread infestation of hydrilla in these lakes, chemical treatment is currently the only effective method for large-scale control. The SFWMD is undertaking a hydrologic study that may result in better coordination of hydrilla treatment and water level management.

As described in the text, the Kissimmee Basin Hydrologic Assessment, Modeling, and Operations Study is an SFWMD initiative to identify alternative structure operating criteria to meet the flood control, water supply, aquatic plant management, and natural resource operations objectives of the Kissimmee Basin and its associated water resource projects.

Comment: *Why have neither loads nor concentrations of total phosphorus declined (along C-38)?*

Response: Concentrations and loads at S-65 have been higher than average. Concentrations and loads downstream would be lower if phosphorus at S-65 could be controlled. The source of higher phosphorus is somewhere in or around the south end of Lake Kissimmee, and could occur within the lake or agricultural inputs.

Comment: *Rapid reduction of headwater discharges to 3000 cfs following extreme high flow events- effects on Kissimmee River?*

Response: Text will be clarified to indicate that the availability of water in the upper basin limits the options for gradually reducing the discharge. For several events in recent years, it has been possible to rapidly reduce discharge at S-65 from higher values to 3000 cfs where most of the floodplain is still inundated. The decrease from 3000 cfs to 1000 cfs can be made more gradually.

Gradual recession in this range creates conditions that are favorable for wetland plant communities and for wading birds. For the events that have followed this protocol, we have not been able to identify any problems caused by the rapid recession. One of the major concerns is

that receding water levels on the floodplain might result in lower concentrations of dissolved oxygen. We have observed oxygen concentrations increasing during the gradual recession.

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

Comment: As mentioned last year by the Panel, an outline of the chapter's contents at the beginning would be helpful for readers. The chapter is quite lengthy and would be strengthened by this additional structuring.

Response: Chapter will be revised to include an outline.

Comment: The use of reference streams to evaluate conditions in the Kissimmee River is an extremely important aspect of the study, given that no historical information exists. It would be useful to include a table with a matrix of the evaluation measures that are to be used to evaluate progress.

Response: Metrics that will be used to evaluate success have been clarified in the text.

Comment: The description of hurricane effects should include information on how effects could be managed or minimized. The management of the Kissimmee should be more clearly related to/integrated with management of the rest of the Everglades system.

Response: Text will be revised to clarify management actions that are taken in response to hurricanes (e.g., modeling, operational flexibility). Text will also be clarified about linkages between hurricane effects on the physical system to biological communities. Text will be added to clarify that the Kissimmee Basin contains the headwaters of the Kissimmee/Okeechobee/Everglades system. It is the largest tributary to Lake Okeechobee (~ 1/3 of total surface flows).

The basin is included in a weekly interagency meeting to review status of entire system and make operational recommendations. Inflows from Kissimmee Basin are formally considered in decision making process for managing flows out of Lake Okeechobee. KCOL LTMP and Hydrologic Model addresses interbasin issues.

Comment: A map of the continuous DO monitoring sites should be added, and DO minima should be included as a metric, as well as means. Depth profilers are also strongly recommended, or at least additional monitoring of bottom-water DO. A sampling frequency is needed that will allow detection of DO sags. DO in the lakes should also be monitored.

Response: A map of the continuous monitoring sites will be added. DO minima are data are used in two of the metrics, this will be clarified. We looked into using depth profilers for this program but cost was prohibitive. However, weekly DO depth profiles (DO sampled at 0.5 m and each meter thereafter to 0.5 m above bottom sediment) were taken at four stations within remnant river channels before and after phase I of the restoration project. These data will be included in the final version of this section.

Comment: The mercury information should be integrated as part of the overall evaluation of mercury in the Everglades.

Response: We will contact the authors of the Everglades section that covers mercury evaluation and discuss integration.

Comment: *In stakeholder surveys, include work on valuing non-market goods.*

Response: To Be Added.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: *p. 11-23, l. 516: We suggest some additional verbiage be added to clarify why BOD increases with increased flow/stage. This could be accomplished by replacing the sentence after the word "increasing" with the phrase "suspended organic solids/nutrients in the water column and resulting in higher biochemical oxygen demand in the river".*

Response: This will be clarified as suggested.

Comment: *p. 11-54, l. 1327: We do not believe that the Asiatic clam (*Corbicula fluminea*) is native to Florida. This can be corrected by moving "*Corbicula fluminea*" outside of the parentheses.*

Response: You are correct. This was an inadvertent mistake and will be corrected accordingly.

Chapter 12: Responses to Peer Review and Public Comments

Teresa Coley, Robert Chamberlain, Richard Alleman,
Trisha Stone, Peter Doering, Rebecca Robbins, Yongshan
Wan, Michael Gostel, David Rudnick, Patricia Walker,
Cecilia Conrad and Kathy Haurert

RESPONSES TO PEER REVIEW PANEL COMMENTS

SOUTHERN INDIAN RIVER LAGOON AND ST. LUCIE RIVER AND ESTUARY

Comment: Does natural dehiscence occur for the seagrass species present, and could it partially explain the data?

Response: Based on limited data it appears that natural dehiscence appears to occur in the Sept/October time frame in this portion of the lagoon for *Syringodium*.

Comment: Will the assessments being produced be able to provide insights about the extent to which seagrass distributions/abundance has been influenced by hurricanes versus by other factors such as water quality (turbidity, nutrients) and salinity?

Response: Yes, however hurricanes produce direct effects such as burial by sediments (which we have observed) as well as indirect effects through their influence on water quality and salinity. For instance, runoff produced from the rain associated with hurricanes can lower salinity sufficiently to cause stress and mortality.

Comment: Where was the other more than half of the funding directed (lines 397-405), and how much of the funding mentioned came in during this water year?

Response: The District's budget period runs from October 1 through September 30. In FY2005, \$142,491 was budgeted for Indian River Lagoon License Plate projects.

Comment: The website supplementary information includes description of an analysis of 10 core samples (collection locations?) from the IRL. In general, the data were described as suggesting "significant anthropogenic contribution of Pb, Cu, and Cr." How will these data be considered in designing improved management strategies?

Response: The data from these cores will be applied to the assessment of muck removal which is a major component of the Southern Indian River Lagoon CERP Project.

LOXAHATCHEE RIVER AND ESTUARY

Comment: Lines 585-603 - What is the design of the cypress seedling study (sampling frequency, N values, etc.)?

Response: The Cypress Seedling Study conducted by University of Florida for SFWMD consisted of several tasks including laboratory and field examinations of salinity, flooding, germination treatments and concentrations of Ca, K, Na in root and shoot systems. In the laboratory study, seedlings were treated with 0, 2, 4, 6, and 8 ppt of sodium chloride and flooded to levels of 0, 50, and 100 percent. The laboratory experiment was replicated three times using first 3 and later 4 seedlings per treatment. For the field analysis, six 1-m² plots were established at a site near River Mile 8.6 on the Northwest Fork of the Loxahatchee River. Bald cypress seedlings were counted and heights were measured. Soil samples and plant tissue were examined for chemical analysis.

Comment: *Lines 616-617 - What were the “elevated water quality values” and the “historic norms”? The information given was insufficient to evaluate the available water quality data, and supporting information (Northwest Fork draft report) described very sparse data (p.2-11, p.2-15) that do not seem sufficient for evaluating statistical trends. Are other data available? Are suspended solids, fecal bacteria, and key nutrients planned for monitoring?*

Response: Since these statements were based only on visual inspection of raw data, the entire paragraph has been expunged.

LAKE WORTH LAGOON

Comment: *This ecosystem, draining a highly urbanized area, was described in supporting information as having a major problem from sediment loading, accumulated as thick muck deposits (sediment accumulation rates ~0.1-0.9 cm/yr). The system also receives high quantities of untreated storm water and other non-point pollution. Are there sewage bypasses as well and if so, what is the extent of that problem?*

Response: There are numerous stormwater inflow points in the lagoon. While not all stormwater inflows have been inventoried, sources of sewage inflows to the lagoon are well documented. There are existing on-site disposal systems, OSDS, i.e. septic tanks, adjacent to the lagoon and throughout the watershed that have been identified for conversion to central sewer systems, as funding becomes available. Wastewater treatment plants, WWTPs, are strictly monitored by the Palm Beach county health department. There can be discharge to the lagoon under emergency conditions or in the case of infrastructure malfunctions. The health department also provides routine monthly monitoring of water quality conditions under the auspices of the Healthy Beaches Program.

Comment: *What is the basis for the evaluation of the LWL as having “rebounded” from the effects of the hurricanes?*

Response: This comment has been deleted from the text.

BISCAYNE BAY (AND SUPPORTING APPENDICES)

Comment: *The writing describes a somewhat unconventional use of salinity as a “conservative indicator of ecosystem health.” Salinity is a conservative parameter, meaning that it is not influenced or affected by biological activity (Day et al. 1989, Estuarine Ecology, John Wiley & Sons). It is not used as an “indicator of ecosystem health” per se. It is instructive for the District to so consider it, as long as other standard indicators of ecosystem health (e.g. nutrient pollution, turbidity and SS concentrations) are also considered.*

Response: The use of salinity as an “indicator of ecosystem health” applies here in its use as an indicator of estuarine habitat suitability. The rationale for this use of salinity is that there is a long term data set for this parameter, it is cost effective to measure/monitor, and it is directly affected by the activities for which the SFWMD is responsible. It is not THE ecosystem health indicator, but AN important primary indicator of ecosystem health/habitat suitability from a District activity/responsibility perspective.

Comment: *Figure 12-20 – Why are water quality sampling stations not located in nearshore waters just offshore Biscayne Bay? Such stations would be helpful, for example, in defining salinities of the boundaries for a water quality model that might be developed for Biscayne Bay.*

Response: This figure does not depict all the historical salinity monitoring sites in Biscayne Bay. Specific monitoring stations were established for purposes of calibrating the TABS-MDS model.

Comment: *Can literature data for sensitive larval stages also be included in Table 12-5?*

Response: Salinity ranges reported here as preferred or tolerated by species which have been proposed/suggested as indicator species for Biscayne Bay were taken from a report funded by the SFWMD. The District has identified the need for a review of existing literature that more accurately/consistently defines these ranges, with an emphasis on identifying preferred and tolerated salinity ranges for all life stages of these and other Biscayne Bay species. Ideally, this would include information on not only preferred salinity ranges, but also the impact of frequency and duration of salinity conditions "out of range", especially for the more sensitive life stages (i.e. larval, egg).

Comment: *Figure 12-23 – What is the cause of the hypersaline conditions in the southwest portion of Biscayne Bay? Required flows to achieve and maintain lower salinities in Biscayne Bay would have to be substantial (lines, 965-970), given the size of the Bay. Are such flows available and sustainable?*

Response: The cause is unknown, but the District is taking steps to find out. This will be clarified later in the text. The flow units in Figure 12-21 will be checked and corrected, if necessary. It's not clear what is meant by “substantial”, but the quantity of flows needed may be just a small percentage of existing flows depending on the objective. Sustainability is unknown, but will presumably be assessed within CERP and the water supply planning process.

Comment: *Lines 991-995 – If the anticipated hypoxia/anoxia in Biscayne Bay leads to increased TP flux from the sediments, will this be of concern in a bay of this size?*

Response: The purpose of this section is to give highlight the need/rationale for nutrient monitoring in Biscayne Bay. The text will be altered to more clearly communicate this need/rationale.

Comment: *The water quality evaluations given on p.12-52 do not appear to be well supported by the data.*

Response: The discussion is supported by the data according to the criteria stated. The text here needs a reference to Table 12-6. Ideally it should be positioned at line 1010, because it refers to the criteria stated in the previous paragraph. These changes have been made.

Comment: *An average ammonia concentration of 800 µg/L in Arch Creek is high, relative to concentrations needed to stimulate algal blooms, and it seems that evaluation of water quality as “generally improved” may be overly optimistic. Similarly, although no increasing trend in NO_x was detected in the Little River, concentrations were quite high, as were NO_x concentrations in Coral Gables Waterway and ammonia concentrations in the Miami River.*

Response: The water quality standard for ammonia-N is 0.5 mg/L = 500 µg/L, (NOT 0.05 mg/L originally stated in the text – it has been corrected, and as stated in the text, nearly all (92 percent) of the results in 2004 were below this value. Algal blooms are not generally caused by nitrogen enrichment in Biscayne Bay because it is a phosphorus limited system.

Comment: *Similarly, although no increasing trend in NO_x was detected in the Little River, concentrations were quite high, as were NO_x concentrations in Coral Gables Waterway and ammonia concentrations in the Miami River.*

Response: “High” is a qualitative term. Florida does not have a specific standard for this compound. Since the Bay is P limited, nitrate does not cause dramatic impacts, but note that it is not in the “green” category. No known impacts are caused by these levels in Biscayne Bay. Values in the table have been double checked to ensure they are correct. As stated, the ammonia-N was at or below the 0.5 mg/L = 500 µg/L criterion at this station the last three years.

Comment: *Lines 1053-1054 suggests a possible sewage signature. What happened to Miami’s WWTPs during the hurricanes (bypasses? for how long?)?*

Response: We don’t know the status of the three regional plants during or after storms in 2005, but is unlikely that overflows would have caused overall increases in ammonia concentrations throughout the year and in the remote areas. We can’t explain the variability. The causes may never be known. It could even be attributed to sampling or analytical influences. It is presented for general information purposes only.

Comment: *Where were the dredge spoils deposited (line 1163), and have associated impacts been considered?*

Response: Miami River dredge spoil is being deposited in a modern, lined landfill in Southern Miami-Dade.

Comment: *How long has ADCP been in operation (lines 1179-1180)?*

Response: The Doppler meters have been deployed for various lengths of time in different canals. In general, it is expected that the meters will be in place 2-3 years in each canal to obtain data with enough range in flows to calibrate new rating curves.

Comment: *Have the cores (lines 1267-1282) been examined for information on eutrophication history and toxic substance inputs?*

Response: The purpose of the study was focused on salinity changes, however, if additional sediment history studies are funded, this aspect may be included in the scope.

Comment: *Appendix 12-2, 1st paragraph - Did DERM sample the 71 sites monthly? And, 1858 results of a total of how many exceeded Florida water quality criteria? Are data for sediments available?*

Response: Yes. The text has been revised to add the word monthly and the total number of samples in the table. Some data for sediments are available, but this would require a large effort to assemble and present in a new section. No routine sediment samples are collected.

Comment: *Appendix 12-2, and Appendix 12-3, Figure 3, and p.12-3-6 – Were these statistically based trends? If not, the writing should be altered.*

Response: The presentation of water quality data here is to give the reader an idea of the long term patterns of basic water quality parameters. Time and resource limitations allow for only data compilation and presentation in graphic form at this time. Text will be changed from “trend(s)” to “patterns” where appropriate. Linear regressions will be performed on data, and r-squared values reported for any significant trends observed, if and to the extent that time allows for the 2006 and future SFER reports.

FLORIDA BAY AND FLORIDA KEYS

Comment: *Why is information not presented on the Florida Keys (major issues, plans of the District, etc.)?*

Response: Highlights of the District’s efforts to improve water quality in the Keys, which are limited to improved stormwater and wastewater treatment projects, are presented in the “Restoration Activities” section. Almost all scientific activities regarding water quality and other aspects of the Keys (including coral reef monitoring and research) are sponsored by other agencies (particularly NOAA and USEPA) as part of the Florida Keys National Marine Sanctuary.

Comment: *In this section, in particular, the emphasis on salinity to the virtual exclusion of nutrient pollution seems a shortcoming. The District’s efforts to track salinity declines are surely valuable, and increased freshwater inflow appropriately is considered as a major factor in the functioning of this ecosystem. But freshwater inflows also carry with them many pollutants that are recognized as causing degradation to coastal ecosystems. Consideration of the interactive influences of freshwater flows and the pollutants they carry, especially nitrogen, at this early stage of management efforts will serve the District well by helping to avoid potential confounding problems in management strategies from such pollutants. Thus, for example, the statement in lines 1311-1313 should be altered for balance (see e.g., the 2004 review in Estuaries 27:157-164). The District can provide a constructive contribution, through the management activities and balanced research that it conducts and supports, in helping to resolve scientific debate about the roles of elevated salinities versus nutrient pollution in seagrass dieoffs and algal blooms.*

Response: A sentence was added at the end of the first introductory paragraph to note the potential role of nutrient inputs to long-term ecological change in Florida Bay. An emphasis on salinity in this report is a consequence of the direct influence of the District on salinity and the strong effect of salinity on estuarine ecology. This emphasis also reflects the fact that the major activity by Coastal Ecosystem Division staff regarding Florida Bay during the past year has been a comprehensive analysis of salinity effects as part of our effort to recommend Florida Bay MFL criteria. Salinity emphasis in the 2006 report does not mean that we are not aware of the importance of nutrient loading and interactions with salinity – nor does it mean that we have ignored nutrient related issues (which have been reported in past Consolidated Reports and last year’s SFER). We have placed a great deal of emphasis on quantifying, understanding, and predicting the water quality effects of changing freshwater flow. This includes monitoring Florida Bay water quality monitoring since 1991, monitoring nutrient loads from the wetland since 1996,

research on nutrient cycling (including ongoing measurements of the bioavailability of dissolved organic nutrients, as reported in last year's SFER), and ongoing development of a water quality model as part of the Florida Bay and Florida Keys Feasibility Study. We have placed equal emphasis on nitrogen and phosphorus in all of our research. While there may be an appearance of imbalanced study in this year's report, such an imbalance in our monitoring, research, and modeling does not exist.

Comment: *Why were only two basins along the northeast coast considered (lines 1440-1443)? It would be helpful to include a brief description of District efforts being conducted elsewhere in the Bay.*

Response: Results were shown for only two basins in this report because they are example basins that are highly sensitivity to changing freshwater flow and that were central to our MFL reporting this year. Results from other basins along the coast and within the bay proper are available and can be reported in future years, either in this chapter or in a CERP RECOVER chapter (SAV monitoring is funded by RECOVER).

Comment: *Lines 1450-1746, Figure 12-33 – *Thalassia testudinum* actually grows well over a broad salinity range (e.g. high salinities - Tomasko et al. 1999, in *Seagrasses: Monitoring, Ecology, Physiology, and Management*, by Bortone (ed.), CRC Press; and low salinities < 5 to > 30 psu - Tomasko and Hall, *Estuaries* 22: 592-602).*

Response: We stated that this species thrives at marine salinity levels and stand by that statement. *Thalassia* if found at a very wide range of salinity in Florida Bay (from under 10 psu to 60 psu), but high tolerance of salinity does not equate to high productivity or reproduction. Results from our seagrass model (which largely uses parameter values derived from mesocosm experiments), as reported in the chapter, indicate that *Thalassia* biomass decreases in the presence of *Halodule wrightii* when salinity drops below 18 psu. In contrast, *Thalassia* is dominant when salinity rises above 40 psu (despite lower net primary production rates with hypersaline conditions than marine conditions).

Comment: *Historically, was *Thalassia testudinum* higher in Joe Bay? What is the basis for the apparent shift from *Cladium* to *Eleocharis*?*

Response: It is unlikely that *Thalassia* was ever was common in Joe Bay. Since 1996, no *Thalassia* has been found in any samples (monthly to bimonthly) taken there. We know of no previous reports of this species occurring there (except Montague et al. 1993 (*Estuaries* 16:703-717) reported that 0.01% of SAV biomass was *Thalassia* at one Joe Bay station during a severe drought).

Comment: *What are the major parameters included in the dynamic model of the seagrass community?*

Response: The major variables of the model are listed in the section "MFL Analysis of Florida Bay SAV – Simulation Modeling". A more detailed description is provided in the Florida Bay MFL report and a draft model documentation report is under review by the Interagency Modeling Center. Following review and (possible) revision of these documents, they could be provided as appendices of the 2007 SFER.

Comment: *What seagrasses historically have dominated the transition zone?*

Response: The identity of dominant SAV taxa in the transition zone has been added to the report text (these are: *Ruppia maritima*, *Chara* sp., *Najas* sp., and *Utricularia* sp.). None of are truly seagrasses.

Comment: *Historically, Thalassia testudinum (with very different physiological optima than Ruppia maritima, e.g., in nutrient regimes, and high habitat value differing from that of R. maritima) was dominant in Florida Bay. Thus, Ruppia maritima may be a suitable indicator seagrass for the transition zone, but not for all of Florida Bay.*

Response: *Ruppia* is only found in the transition zone ponds and bays and not in Florida Bay proper, where *Thalassia* dominates (often with the presence of *Halodule*). Nevertheless, the Florida Bay MFL identifies *Ruppia* as an indicator for both the transition zone and the bay. The logic of this recommendation is two-fold. First, when *Ruppia* loss occurs in the transition zone because of high salinity, the loss of all other SAV taxa in this zone also occurs. We contend that the complete loss of SAV habitat in this zone constitutes “significant harm” and thus *Ruppia* is an appropriate indicator for MFL criteria recommendations. Second, when salinity conditions in the transition zone are at the threshold for *Ruppia* loss (about 30 psu), salinity conditions in northeastern Florida Bay are typically greater than 40 psu and this condition appears detrimental to this region of the bay (with the likely loss of *Halodule*, based on seagrass model results, and decrease in forage fish base, based on this model output combined the reported statistical model of fish abundance). Thus, because of hydrologic linkage between the transition zone and the bay, *Ruppia* is also an indirect indicator of the ecological status of northeastern Florida Bay. Note that our MFL analysis does not pertain to all of Florida Bay, but is limited to the northeastern Bay because of limitations in salinity prediction at the time the report was drafted.

Comment: *What is the basis for description of Halodule wrightii as a more valuable habitat species than Thalassia testudinum?*

Response: We do not state that *Halodule* provides higher quality habitat than *Thalassia*, but rather state that: “almost all fauna benefit from increased *Halodule* cover”. *Thalassia* is a strong dominant through most of Florida Bay and monospecific *Thalassia* beds are common. In contrast, monospecific *Halodule* beds are rare. Results from our seagrass model indicate that salinity is an important factor influencing whether seagrass beds are dominated by one species or have mixed species. Results from statistical analysis of higher trophic level species, combined with results from the seagrass model, indicate that mixed species seagrass beds provide the highest quality habitat for the forage fish assemblage. We do not know whether this result reflects decreasing *Thalassia* density (many fish species have lower abundance in high density, monospecific *Thalassia* beds than in lower density beds) or whether habitat heterogeneity has an inherent benefit or whether *Halodule* itself has some benefit.

CALOOSAHATCHEE RIVER AND ESTUARY

Comment: *What data were used in support of invoking decreased salinity and water clarity over other factors (lines 2095-2096, 2167-2168) in the SAV decline?*

Response: This statement (2095-2096) was not based on analysis of data and has been deleted from the report. Lines 2167 and 2168 have been rewritten to more accurately describe the data.

Comment: *What is the salinity tolerance/optima for Vallisneria americana, and what is its general ecology?*

Response: “Vallisneria indeed could not survive salinities greater than 10 psu in the long term, at least not robustly” (French and Moore 2003). Other aspects of the general ecology of *Vallisneria* in estuarine environments can be found in the publications below.

French, G.T. and K.A. Moore. 2003. Interactive Effects of Light and Salinity Stress on the Growth, Reproduction and Photosynthetic Capabilities of *Vallisneria americana* (Wild Celery). *Estuaries*, 26: 1255-1268.

Doering, P.H., R.H. Chamberlain and D.E. Haunert. 2002. Using Submerged Aquatic Vegetation to Establish Minimum and Maximum Freshwater Inflows to the Caloosahatchee Estuary, Florida. *Estuaries*, 25(6B): 1343-1354.

Doering, P.H., R.H. Chamberlain, K.M. Donohue and A.D. Steinman. 1999. Effect of Salinity on the Growth of *Vallisneria americana* Michx. from the Caloosahatchee Estuary, Florida. *Florida Scientist*, 62(2): 89-105.

Comment: Are data available for species other than *Halodule wrightii* (Fig. 12-41)? Why are data from only 4 of the 8 stations included (as in lines 2237-2240)?

Response: *Vallisneria* occurs at Stations 1, 2, 4. *Halodule* only at 5 and 6 and *Halodule* and *Thalassia* at 7 and 8. Stations 1,2 and 4 are monitored monthly; 5,6,7,8 are monitored every 2 months.

Comment: Lines 2286-2298 - It appears that a small proportion of the variance in chlorophyll a levels is explained by TN loading. Have relationships between chlorophyll a and N_i (inorganic N) species also been examined?

Response: Yes, see Appendix 12-6.

Comment: Or between dominant problematic phytoplankton taxa and N_i concentrations/loadings? Such analyses could yield potentially valuable information.

Response: No.

SOUTHERN CHARLOTTE HARBOR

Comment: How is oyster health assessed (line 2479)?

Response: The health of oysters is assessed by measuring the intensity and prevalence of infection by the parasite *Perkinsus marina*, and condition index of individuals, and the density and live/dead ratio of populations on oyster bars.

PEER REVIEW PANEL CONCLUSIONS

1. The major goal of the District in managing the nine coastal ecosystems within its purview is, insofar as possible, to manage freshwater discharges – timing of delivery, quantity, and water quality – so as to preserve, protect, and restore essential estuarine resources.

2. Three major issues impacting the coastal ecosystems are anthropogenic freshwater discharges (timing, magnitude), (#2) increasing inputs of nutrients and other materials of concern, and (#3) loss of critical ecosystem habitats and communities.

3. Several aspects of this comparatively young, complex program are already well developed, especially efforts to describe the hydrology and salinity regimes of the estuaries through both intensive monitoring and modeling.

4. The District has targeted certain valued ecosystem components (VECs or indicator species, as seagrasses and eastern oysters) that are being monitored to varying degrees in the nine ecosystems as targets for restoration. Sound rationale is given for emphasis on these organisms as VECs.

5. The District, together with partner agencies, is engaged in various projects designed to stabilize hydrology, reduce pollutant loads, and restore habitat, and in many needed planning activities.

6. Description of these nine coastal ecosystems, and the District's actions and plans in managing them, is a massive subject, requiring the difficult task of determining materials to include versus exclude in the chapter and supporting information. Thus, while the chapter is generally well written and contributes excellent information and insights in describing this large, complex program, some additional key information is needed, especially to address the second and third major identified issues (above).

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

1. The Panel recommends inclusion of an overview in the Introduction, with charts or tables and supporting text, to clarify the plan in managing the nine coastal ecosystems and plans for changes in the management program (e.g. plans to include other coastal areas as priority coastal water bodies; plans to emphasize some ecosystems over others in a rotating schedule, etc). Coverage should include a description of the District's plans and actions to manage the natural resources of the Florida Keys, which thus far are mentioned briefly but then missing from the information provided.

Response: A general overview of the District's coastal ecosystems Program will be included in future reports.

2. Within each subsequent ecosystem subsection, the Panel recommends including as "up-front" summary information the explicit restoration goals, in numerical terms where possible, and supporting rationale; invasive species and threatened/endangered species; a summary table of District activities; and more complete maps showing the locations, structures, and sampling stations mentioned in the text. For clarification, information on the Caloosahatchee River and Estuary should be separated from the South Charlotte Harbor subsection.

Response: Up-front summaries can be included in future reports. Many of the maps in the 2006 report have been modified to show more locations structures and sampling stations. Redundancies in the Caloosahatchee and Southern Charlotte Harbor sections have been removed.

3. The Panel recommends that the importance of freshwater flows and altered salinities be considered together with other important factors in affecting the coastal ecosystems. In particular, it would be helpful to consider the potential importance of nitrogen (loading and concentrations of TN and inorganic nitrogen forms) in contributing to the degradation of these coastal ecosystems, and in compromising their recovery even when problems with hydrology can be corrected.

Response: We concur. Changes in freshwater inflow will influence how nutrients are processed not only by changing loads but also by changing hydraulic residence time.

4. *The Panel recommends inclusion of water quality data summaries as key information. In addition, a brief description should be added of the statistical analyses that were performed to support conclusion statements about water quality and indicator species.*

Response: This recommendation will be considered for future reports.

5. *The Panel recommends that within each ecosystem subsection, the monitoring efforts should be clearly summarized in a table (District and other agencies involved, duration, frequency, parameters, depths monitored, locations/size of sampling areas and transects, ground-truthing efforts for assessing submersed aquatic vegetation, and N values). Planned improvements in the monitoring programs (by the District and other agencies) should also be included in the summary information.*

Response: This recommendation will be considered for future reports.

6. *The Panel recommends inclusion of a separate section on EACs and VECs following the Introduction, including clarification by ecosystem of where these criteria have/have not been developed/planned/in progress. This section should include rationale for selection of the targeted VECs, and tables of the range of environmental conditions where the indicator species occur, thrive, and are stressed (e.g. including salinity, nutrients [TP, inorganic N forms, TN], and light for seagrasses and the freshwater/brackish species, *Vallisneria americana*; salinity and dissolved oxygen for eastern oysters). Data from Texas estuaries should also be considered (especially Baffin Bay) in modifying the summary tables.*

Response: A section on VECs would be useful and could substantially clarify and shorten the chapter. This recommendation will be considered for next year's report depending on its format and content.

7. *The Panel recommends that for ecosystems associated with highly urbanized areas, the District should encourage development of a plan to examine the history of toxic substance accumulations in the sediments and impacts of toxic substances on the benthic food webs.*

Response: This is not part of the Coastal ecosystems Division's mission and is more appropriate for the Florida Department of Environmental Protection. Any future consideration would require specific policy direction.

8. *The Panel recommends that the District continue to develop plans to take advantage of opportunities to coordinate work on South Florida's estuaries.*

Response: Coordinating activities in South Florida's coastal ecosystems with Federal, State and local partners has been a goal of the Coastal Ecosystem Division's program. Our track record speaks for itself. For example, our work in Florida Bay comprises one part of a larger cooperative program that includes NOAA, USGS, Florida International University, Miami-Dade DERM, National Park Service, EPA, Florida Atlantic University, Louisiana State University, and Florida Fish and Wildlife Conservation Commission.

9. *The Panel recommends that cores (as in Appendix 12-3, Biscayne Bay) be examined for information on eutrophication history; or, if such data are available, the Panel recommends*

inclusion of summary information on this important topic, from which many insights can be gained.

Response: This is a good suggestion and staff will consider including such an analysis in future research plans.

The Panel discussed suggestions for reporting on the District's (massive) coastal ecosystem effort. The Panel did not feel comfortable in stipulating what might be best--rather, the Panel considered that such a decision would best be left to the District--but one suggestion that was favorably received was to rotate on reporting for the nine coastal ecosystems, e.g., with concerted effort on five ecosystems one year, and the other four the next, or perhaps three ecosystems per year on a three-year rotation.

Response: Coastal Ecosystem Division Staff agree that Chapter 12 requires a different format. While it is important to report on the environmental condition of and District activities in all 9 coastal systems, this could be done in a more parsimonious fashion, with the remainder of the chapter emphasizing a subset of the systems.

RESPONSES TO USDOJ – TECHNICAL REVIEW COMMENTS

Comment: *p. 12-14: Any indication as to how much of the seagrass impacts are attributed directly to the hurricanes versus indirect impacts resulting from poor water clarity and high freshwater discharges from water management operations? Biscayne Bay seagrass wasn't impacted by Hurricane Andrew as much as initially thought. Curious as to whether the difference is attributed to larger anthropogenic influences in the St. Lucie estuary.*

Response: The southern monitoring site was directly affected having been buried with sediments. The northern site may have responded to freshwater discharges associated with the hurricanes.

Comment: *p.12-1, line 29: The statement "they represent consistent features of the estuarine landscapes" is relative. How do you define consistent? Seagrass beds have definitely come and gone as have oyster beds - long before 1900. We have documentation of the movement of SAV in our BB and FB cores. Donna Surge and others have shown changes in oyster beds for SW coastal areas.*

Response: We agree that the term "consistent" is relative. In the context of using seagrass and oysters as valued ecosystem components, a time scale covering the past 100 years or so would be germane.

Comment: *p. 12-2, lines 54-55: What about the SW coastal area from Ten Thousand Islands south to Cape Sable? Surely this is a critical coastal system that needs to be considered since changes in flow through Shark River Slough have impacted this area. Why is it not listed as a "priority coastal water body"?*

p. 12-5, lines 145-146: See note above on page 12-2: why is SW coastal area not included?

Response: The area of the Ten Thousand Islands between Cape Romano and the Everglades National Park Boundary is covered under the Naples Bay program. As resources become available, we would like to include more information on this area. Inclusion on the priority water body list is a matter of policy determined by the District and the Florida Department of Environmental Protection.

Comment: p. 12-4, line 106, *Owing to the pattern of glaciation, Florida's coastline is flat, with little topographic relief on: This implies Florida was glaciated - perhaps it would be better to say something like "Patterns of sea-level change during the Pleistocene interglacial high-stands and the glacial low-stands created Florida's flat coastline . . . "*

Response: Wording has been clarified.

Comment: p. 12-5, line 123: *Also, may want to add something here about the ability of the organisms themselves to filter the water. If you loose certain species (for eg. sponges), than a negative feedback system develops - fewer sponges (etc.), more turbidity, therefore less light, more die-offs, etc.*

Response: While this is true the emphasis of the paragraph is on coupling of an estuary with its watershed rather than a detailed discussion of internal processes that may affect water quality.

Comment: p. 12-35: *The section on Lake Worth Lagoon was very sparse compared to other sections. Was less focus placed on LWL? The description of direct of indirect damage from the 2004 hurricanes is uninformative. A discussion on the delisting of LWL from impaired water body list should be presented here.*

Response: We concur with the comments and anticipate developing a more consistent approach to identifying key comparative factors and providing more balanced narrative for all water bodies in future reports. We added text to the section to reference delisting from the impaired water body list.

Comment: p. 12-43, after line 951: *Somewhere in this section on Environmental Condition, may want to mention invasive species. For example USGS is working with BNP to determine the distribution of the invasive gastropod *Melanoides tuberculatus*, and to determine what impact it is having on the native populations (terrestrial and estuarine), and whether it is a threat to human health.*

Response: The Coastal Ecosystems Division does not have any staff devoted to invasive species. Chapter 9 in this report addresses invasive species.

Comment: p. 12-47, line 966: *But what is the goal here? To maintain the current species (late 20th century species), and therefore create salinities that sustain these populations? Or is the goal to "restore" the system to pre-anthropogenic state as much as possible? If the later is the case, then some of the current species may not be the historical populations.*

Response: This is still a matter of debate for Biscayne Bay. A good model for hydrologic restoration is the report "Evaluation of Restoration Alternatives for the Northwest Fork of the Loxahatchee River".

Comment: p. 12-58, line 1118, "in a more natural way": *Will ecosystem history data from USGS funded by the District be used here? If so, may want to mention the work.*

Response: It is likely that the paleo-information will be used in some way. This project is discussed in another section see page 12-65.

Comment: p. 12-65, line 1267: *Could identify references to published reports*

Response: Citations have been added to report.

Comment: p. 12-66, lines 1307-1308: "Most" may not be the best choice of words - especially if describing current conditions. Look at "Florida Bay Bottom Types" map produced by Prager and Halley, 1997, USGS OFR 97-526.

Response: "Most" changed to "Much".

Comment: p. 12-71, lines 1410-1411: In the other sections, ppt is used. It's preferable to be consistent, or at least provide a chart showing the relationship of psu to ppt. My recommendation would be to keep all discussions and charts in ppt.

Response: Salinity is a measure of the concentration of dissolved salts in seawater. Salinity is defined as the ratio of the mass of dissolved material in sea water to the mass of sea water (UNESCO, 1985). But this 'absolute' definition is not practical. Salinity was measured by a chlorinity titration but with the development of the salinometer, which utilizes conductivity, a new definition was developed. The 'practical salinity' (S) of a sea water sample is defined as the ratio of the electrical conductivity of the sample (at 15 °C, and one standard atmospheric pressure) to that of a standard solution of potassium Chloride (KCl). A ratio of 1 is equivalent to a 'practical salinity' of 35 (UNESCO, 1985).

Until recently, salinity was expressed as parts per thousand (ppt or ‰). Subsequently, adoption of the 'practical salinity' gave rise to the 'practical salinity unit' (psu). However, 'salinity', defined as the ratio of two quantities of the same unit, is a 'dimensionless quality', i.e. takes no units. Therefore, it is correct to speak of a salinity of 35 (UNESCO, 1985). Baretta-Bekker et al. (1992) suggested that, in most cases, where a high degree of accuracy is not required, old and new figures for salinity can be used interchangeably.

Baretta-Bekker, J.G., E.K. Duursma and B.R. Kuipers. 1992. Encyclopaedia of Marine Sciences. Berlin: Springer-Verlag.

UNESCO (United Nations Educational, Scientific and Cultural Organization). 1985. The International System of Units (SI) in Oceanography. Report of IAPSO Working Group on Symbols, Units and Nomenclature in Physical Oceanography (SUN). IAPSO Publication Scientifique, No. 32, UNESCO Technical Papers in Marine Science, No. 45.

Comment: p. 12-76, after line 1599: I thought performance measures also used paleosalinity data.

Response: CSOP takes into account RECOVER performance measures, which are in part based on paleo-information.

Comment: p. 12-79, lines 1685-1686: *Ruppia* is currently the dominant SAV, or it should be? The transition zone is relatively broad, and my own field experience says *Ruppia* is not currently the dominant species.

Response: Goal is not to make *Ruppia* dominant, loss of *Ruppia* is an indicator of significant harm.

Comment: p. 12-79, lines 1716-1717: But sediment stability, water depth/exposure during low tides, etc. also are important variables in determining *Thalassia* versus *Halodule* distribution.

Response: We agree, the discussion pertained only to effects of salinity.

Comment: *p. 12-80, line 1746: Halodule only? Not SAV in general, or Thalassia too?*

Response: Halodule does not generally occur alone. Halodule in mixed beds appears to benefit forage base.

Comment: *p. 12-88, lines 1933-1934: I thought Surge and/or Savarese did some work on distribution of oyster reefs in SW area, including Estero Bay. (See item 1 listed below in Hydrologic History - wasn't this part of that work?)*

Response: This was a stand alone project in Estero Bay funded by the District.

Appendix 12-1: Responses to Peer Review and Public Comments

Yongshan Wan and Gordon Hu

RESPONSES TO PEER REVIEW PANEL COMMENTS

In this appendix, the authors describe the hydrologic and salinity models used in the Northwest Fork of the Loxahatchee River restoration alternative evaluations. Three models were developed: (1) a hydrologic model watershed model (WaSh) to develop flows into the River based on rainfall, infiltration, and transport processes occurring in the watershed; (2) a hydrodynamics and salinity model to relate freshwater inflows to salinity in the Northwest Fork; and (3) a long-term salinity model used to forecast salinities for several decades. The first model is a derivative of the well-known HSPF model modified to include a groundwater component that coupled surface water and groundwater – a feature essential for Florida’s soils. This model has a water quality component that was not utilized in this study. The second model is based on the RMA-2 and RMA-4 models, again well known finite element models used for simulating water transport in rivers and estuaries. The third and final model is a management model that incorporates rather straightforward algebraic equations.

Comment: The authors present a good account of the work performed, and the work itself has been for the most part performed in a scientifically defensible way. What could be made clearer in the document is a statement of purpose of the effort and how the models were selected for the tasks to be performed and the purpose to be achieved.

Response: Addressed in the Introduction section with additional text and a table.

Comment: If the purpose of the work was to model constituents beyond salinity, if time-dependent flows and velocities are needed for later work, and if time-dependent constituent concentrations were indeed needed then the models used were indeed appropriate. Information presented at the hearing indicated that the models were already in place and being used in the Loxahatchee River and estuary, so their use for salinity modeling was appropriate.

Response: It was communicated to the panel that indeed we needed the model also for time-dependent flow and velocities for other projects.

Comment: The Panel noted that relatively few stations on streams/canals were available to calibrate and validate the watershed model, and only one groundwater station (a well) was used. Because the HSPF model was being used to model groundwater as well as surface water flow, using only one groundwater station for calibration appeared to be inadequate. Information was presented during the hearing indicating that more than one well was used during the model calibration. The sensitivity analysis showed that evaporation coefficients and infiltration parameters were the most sensitive model parameters in completing the water budget calibrations. If this is the case, then the groundwater model calibration is the most important for the hydrologic estimations. Calibration of the HSPF model using only one direct groundwater measurements appears to be the weakest part of the calibration/validation process.

Response: The calibration result with the data collected from the other well was included in the document. The overall groundwater regime for each of the land use types in the watershed was evaluated during the water budget calibration stage. Additional calibration work shall be done as more groundwater data are collected.

Comment: The Panel noted that it would be helpful to list the performance criteria being used and the values of those measures that would demonstrate that the models were indeed calibrated and validated. Those performance criteria included the DV, NS, and R^2 and in response to Panel comment information of this type was provided. The Nash-Sutcliffe coefficient (NS), for example, was said to vary between 1.0 indicating a perfect fit (i.e., when $Q_s = Q_m$ in every case, which is obvious) to 0 indicating the model is predicting no better than the average of observed data (i.e., when $Q_s = \bar{Q}$ in every case, again obvious). But in the application of the model, it is the average that is desired; this permits the average freshwater inflow to be related to average salinity at a given location. Thus, for the question, “Is the goal 1.0 or 0?” the response was the greater the better because it was the time-dependent solution being tested for performance, not the average. For the coefficient of determination (R^2) in response to the Panel’s question whether it is being used in a statistical sense (with independence of X and Y) or strictly as a measure, the authors also noted that the Correlation Coefficient (r) would be more appropriate than the Coefficient of Determination (R^2) and that r should be greater than 0.5 for acceptance.

In Table 12-5, the Panel noted considerable difference between the DV values for calibration and validation at almost every station, and it was not clear to the Panel or the authors why such a discrepancy should occur.

Response: Clarifications were made accordingly in the text.

Comment: In Figure 12-6, the Panel noted significant differences between observed and modeled runoff in summer and fall 1997, in winter 1998, and in fall 1999. The text implies that the differences were related to the quality of the rainfall data, but the Panel was curious whether there was clear reason to suspect the rainfall data and what analysis of other model parameters and/or field data was done to explain the model results.

Response: One of the causes may be difference in the data quality and hydrological viability between calibration and validation periods. We shall investigate this further when the model is refined.

Comment: The text indicates that calibration of groundwater level was conducted as the last step of the WaSh model calibration, and the Panel noted that it was curious that groundwater calibration was not done first given the sensitivity of the model results to vertical movement of water through evaporation and infiltration as noted earlier. Further, the results given in Figure 12-8 indicated significant lag and over prediction of the observed results. The authors noted that the HSPF model surface flow and cell to cell flows had been modified so that the vertical movement of water was not as important as the surface flows calculated in the canals and reaches.

The Panel noted that it was not clear why the RMA models were needed for this work. A simplified model for linear estuaries or a finite segment model could have produced the same results in a much shorter time and less expense. For simplified models, the mass balanced-based model for conservative substances in estuaries can be applied. The equation is:

$$s = s_0 e^{\left(\frac{Ux}{E}\right)}$$

where s = salinity concentration at some point, x , upstream from x_0 , s_0 = salinity at an arbitrary downstream point x_0 that represents the “source” of the salinity, U = average net velocity in the estuary (calculated as freshwater flow, Q_{fw} /cross-sectional area, A), and E = longitudinal dispersion coefficient. The values for “ b ” in Table 12-10 are in essence values of U/E and the values of “ a ” are close to values of s_0 , or 35.5 ppt. Assuming E is constant, then the variation in “ b ” is due to variations in Q_{fw}/A .

Response: This was addressed in the previous paragraph. The panel indicated in the conclusion that they accepted the explanation that we indeed need a more sophisticated model for other projects. The panel also noted that the 2-D model was already in place when the restoration project started. Nonetheless, the method the panel described here would be a valid technical approach too.

The Panel noted that boundary conditions both at the freshwater inflow end and the ocean end of the system will have considerable impact on the salinities calculated at stations within the estuary and asked at what boundary was the tidal record entered and how well did it match the actual record at some gauging station. The authors indicated that the boundary was a gauging station near the mouth of the estuary and that the 35.5 ppt salinity as the boundary concentration was the salinity of water entering the estuary on the flood tide.

The Panel asked about the fixed elevation value of the salinity sensors providing data shown in Figure 12-14, and the authors noted that the sensors were located in the vertical so that they were always submerged regardless of the tide. A table was provided listing sensor elevations at three stations.

The Panel noted that there was discussion of scenarios and the ecological benefits of each and the freshwater flows needed to realize those benefits. While the flows needed for each scenario were presented in Table 12-15, there was no discussion of these scenarios presented, and the question raised was whether those scenarios were beyond the scope of this particular appendix. The authors noted that the appendix was limited to the technical approach in hydrological and hydrodynamic modeling and that assessment of the modeling results and the feasibility study are ongoing and will possibly be included in next year’s SFER.

The Panel noted that driving forces that affect salinity include the phenomena mentioned by the authors but also coastal ocean sub-tidal water level effects, especially storms and meteorological events on the scale of days to weeks, which can add or subtract from the astronomical tide due to offshore/onshore movement of water. The authors noted that they have teamed up with FDEP to develop an integrated 3-D model that would simulate both surface and groundwater movements within the Loxahatchee estuary and that the project also includes a component to address the sub-tidal drive force in addition to astronomical tides.

In this same regard, the Panel noted discrepancies between model output and field observations in Figure 12-14. The authors responded that several factors affect model accuracy: (1) uncertainty in freshwater input; (2) exchanges between groundwater and surface water; (3) reduced estimates of salinity range between high and low tides with 2D depth-averaged models because stratification is not modeled; and (4) sensor placement in the vertical dimension and the water mass being sampled. They expect the 3-D integrated model to improve salinity prediction accuracy by addressing points (2) and (3).

RESPONSES TO PEER REVIEW PANEL CONCLUSIONS

1. In this Appendix, the authors describe the hydrologic and salinity models used in the Northwest Fork of the Loxahatchee River restoration alternative evaluations. Three models were developed: (1) a hydrologic model watershed model (WaSh) to develop freshwater inflows to the River based on rainfall, infiltration, and transport processes occurring in the watershed; (2) a hydrodynamics and salinity model to relate those freshwater inflows to salinity in the Northwest Fork; and (3) a long-term salinity model used to forecast salinities for several decades. The WaSh model is a derivative of the sophisticated HSPF model and has been modified to address surface water and ground water flows, an essential feature of any watershed model in Florida. The second model is a sophisticated hydrodynamic model (RMA models) used to estimate average salinities at various distances up the Loxahatchee estuary coupled with a statistical model (for which a simplified estuarine model for conservative substances could have been used) to easily calculate average salinities at those same points, and the third is an empirical model used to transition from one annual average salinity to the next assuming an exponential change between the two.

2. The approach used was a reasonable one given the WaSh and RMA models had already been applied to the Loxahatchee River and estuary and were simply being used to address the question of salinities that would be experienced at various points in the river and estuary for given freshwater inflows.

3. If the purpose of the work was to model constituents beyond salinity, if time-dependent flows and velocities were needed for other work, and if time-dependent constituent concentrations were indeed needed, then the models used were indeed appropriate. Information presented at the hearing indicated that the models were already in place and being used in the Loxahatchee River and estuary, so their use for salinity modeling was appropriate.

RESPONSES TO PEER REVIEW PANEL RECOMMENDATIONS

1. The Panel recommends that a map of the area showing the geographic features, sampling stations, streams, etc. mentioned in the text and that a bathymetric map of the estuary be included in the chapter.

Response: Two maps have been added to the revised text. One is a bathymetric map. The other is a map that shows the geographic features, streams and tributaries and river miles where the sampling stations are located.

2. In Table 12-5, the Panel noted considerable difference between the DV values for calibration and validation at almost every station, and it was not clear to the Panel or the authors why such a discrepancy should occur. The Panel recommends that this discrepancy be investigated further.

Response: Agree. We will submit the results to next year's SFER when they become available.

3. Although the authors noted that the appendix was limited to the technical approach in hydrological and hydrodynamic modeling and that assessment of the modeling results and the feasibility study are ongoing and will possibly be included in next year's SFER, the Panel recommends that the feasibility study results be included in next year's SFER.

Response: Agree. We will submit the results to next year's SFER when they become available.

4. The Panel noted with interest that the authors have teamed up with FDEP to develop an integrated 3-D model that would simulate both surface and groundwater movements within the Loxahatchee estuary and that the project also includes a component to address the sub-tidal drive force in addition to astronomical tides. It is recommended that this 3-D model be included in next year's SFER for review.

Response: Agree. We will submit the results to next year's SFER for panel review when they become available.

5. The Panel recommends that the clarifications provided by the authors to the various comments made to the Appendix be addressed in the final version of the Appendix.

Response: In response to a panel comment, a sentence about nutrient loading calculation by the LSM was removed from the text since it was not in the scope of the project concerned.

In response to a panel suggestion, a graph was created and added to the text that presents the salinity gradients based on data in Table 12-16.

In response to a panel suggestion, the tidal residuals between predicted and observed values were evaluated. Since it is hard to print the residuals at several thousands data points in a graph, we finally conducted statistics on the tidal residual and added tables that list the absolute and relative magnitude of tidal residual as well salinity so that a complete analysis of model accuracy was presented in the text.